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Prophylactic role of diltiazem Against gamma radiation induced lesions in mice

V.S. Shekhawat and P. K. Goyal

ABSTRACT

To determine the effect of radiation, quantitative variations in the number of total leucocytes in peripheral blood of mice were scored at various post-irradiation autopsy intervals from 12 hrs. to 28 days. In lower doses (2.5 Gy and 5 Gy), depression in leucocytes number was noticed till day 1, whereas in higher dose (7.50 Gy) it was upto day 3 after radiation exposure. Subsequently, number of such cells increased but remained below normal even till the end of experimentation (i.e. 28 days). Administration of diltiazem prior to irradiation prevented high reduction of leucocytes count and initiated an early recovery. However, the normal value of such blood cells was restored by 28 days in 2.5o Gy group only.

Keywords : Aging, Gamma radiation, Diltiazem, Leucocytes, Swiss albino mice.

Introduction

Normal aging involves a progressive deterioration of tissues, accompanied by a decline of functional reserves and adaptive power. This leads eventually to disease and inevitably to death. Irradiation increase the incidence and/or the severity of disease by causing a non-specific diffuse deterioration of the body tissues.

Extensive research has been made in recent years to investigate a suitable chemical radioprotective agent which can be administered

safely before irradiation to check radiologic lesions. Several chemical compounds like cysteine (Patt. *et al.,* 1958) cysteamine (Bacq, 1953), AET (Doherty and Barnett, 1955), 2-mercaptopropionly glycine (Sughara et al., 1970), WR-2721 (Uma Devi and Prassanna, 1990), Liv. 52 (Daga *et al*., 1995), Mentha extract (Samarth *et al*., 2001), diltiazem (Shekhawat and Goyal, 2001), and melatonin (Manda and Bhatia, 2002) have been shown to afford a high degree of protection in mammals. However, some of these were found as toxic at the optimum protective does level which limits their practical use in clinical fields.

The present study is an attempt to ascertain the protective competence of diltiazem against radiation induced leucocytes changes in peripheral blood of mice. Aim and utilization for using this drug is that, radiation affects lipid metabolism, and a consequence of radiation-induced lipid peroxidation of cell membrane structure may be ionic leakage through cellular membranes and enhanced intracellular entry of calcium with consecutive deregulation of many cellular process. By reducing this influx, calcium channel blockers (diltiazem in the present study) might prevent cellular injury due to membrane impairment. This view is supported by the observations that calcium antagonists inhibit reperfusion injury, which can be attributed to the release of free radicals with peroxidative disintegration of cellular membrane and heavy intracellular accumulation of calcium (Opie, 1989).

Materials and Methods

Young-adult male Swiss albino mice of 6-8 weeks old, weighing 22 + 2 gms., were selected from a closebred colony maintained on standard mice feed and water *ad libitum*. Animals selected for this study were divided into four groups. Animals of group-I were injected intraperitoneally (i.p.) with double distilled water or DDW (Volume equal to diltiazem) to serve as normal, while animals of group-II, were given diltiazem (100 mg/kg b.wt.) alone intraperitoneally. Animals of group-III received DDW (Equivalent to DTZ) and then exposed to different doses of gamma radiation (2.5, 5.0 or 7.5 Gy) at the dose rate of 1.014 Gy/min. to serve as control. Animals of group-IV were given diltiazem (As in group-II) and after 30 minutes exposed to different doses of gamma rays (as in group-III) to serve as experimental. At least 6 animals from each group

were autopised at 12 hrs., 24 hrs. 3 days, 7 days, 14 days and 28 days post-treatment.

The blood samples from sacrificed animals were collected from caudal vein in a vial containing 0.5 M EDTA and total leucocytes count (TLC) was performed by the routine procedure.

Results

Animals treated with DTZ alone (Group-II) did not show any significant change in their values and were found comparable to normal at all the autopsy intervals. The leucocytes count in general showed a decrease after irradiation at all the dose levels used. The depletion in count was more rapid during first 24 hrs. Thereafter, it increased slowly till day 28 at lower doses (2.50 and 5 Gy) in both the control (only irradiated) and experimental (diltiazem + irradiated) groups of animals. The normal level of leucocytes were restored on day 28 in the 2.50 Gy irradiated ones in the presence or absence of diltiazem. A significant elevation in leucocytes number was noticed at day 3 and in 2.50 Gy exposed animals (Fig. 1).

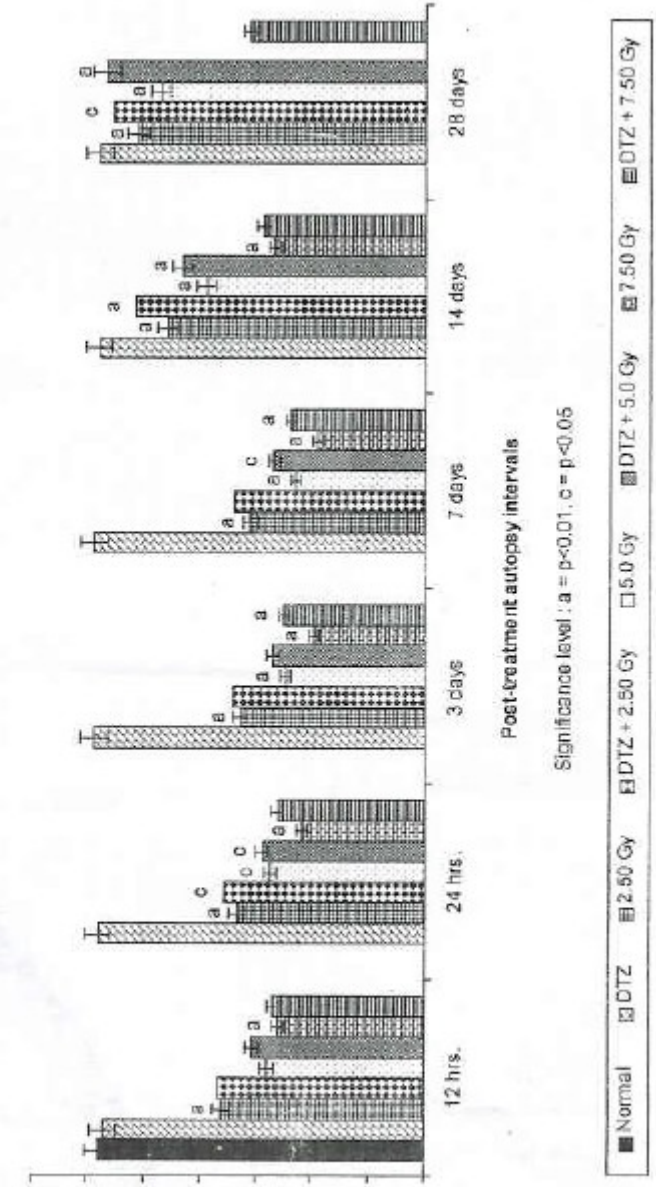
The pattern of leucocytes variations was essentially similar in 5.0 Gy dose also but the normal count was not attained in both the control and experimental groups even till the last autopsy interval. However, the depression was less marked in the drug treated animals and a significant protection was noted at 24 hrs., and days 7,14 and 28 of post-treatment (Fig.1).

In the higher dose 7.50 Gy), an exponential diminution in the number of leucocytes was observed till day 3 and then it elevated but remained far below the normal level upto day 14 in irradiated group and day 28 in diltiazem + irradiated groups. However, no animal could survive at this radiation dose in control group after 14 days, while in experimental group survivility was noticed even till the end of experimentation. The counts were found significantly higher at days 3 and 7 of irradiation.

Discussion

The results from the present study indicate that leucocytes count show a drastic reduction within first 12 hrs. of irradiation which is followed by a slow decline during succeeding autopsy intervals.

Fig. 1 : Variations in leucocyte count (per cmm) at different autopsy intervals in mice after gamma rays exposure with (experimental) or without (control) diltiazem



This finding is in close corroboration to some earlier workers (Spalanger and Cassen, 1967; Rubin and Cassarett, 1968; Baum *et al.,* 1969; Kumar *et al.,* 1995) who noticed a maximum depression in number of leucocytes within first 24 hrs. after irradiation. In 28-30 weeks old mice, a spontaneous reduction correlates that radiation causes aging, hence depletion in total leucocytes counts as well.

The early depletion in leucocytes count observed in the present investigation is attributed mainly to a direct killing of lymphocytes, which are the most radiosensitive components of peripheral blood. The later depression in the count noticed is due to the decreased number of new leucocytes entering in peripheral blood circulation owing to the damage to stem cells in haematopoietic organs as in ageing, since WBC play key role in the defense system of body. Kumar (1993) also had similar view for decreased leucocytes number in peripheral blood. Radiologic aging may be caused due to an increase in the density and amount of connective tissue, a reduction of the fine vasculature, and a decrease in the number of parenchymal cells.

The higher leucocytes count in experimental animals (group-IV) than the control (group-III) suggests that Diltiazem has checked the rapid decrease of such cells in blood. It is postulated that the drug imparted its significant protective effect against direct cell killing due to radiation. Its protective efficacy against radiation induced lesions to the bone marrow has already been reported (Nunia and Goyal, 2002), which can be ascribed for a higher count of leucocytes at later autopsy intervals, because damage to stem cells is inhibited and hence, comparatively more leucocytes population enter into general circulation. Thus, radiation induced damage is prevented and leucocytes count is protected by diltiazem against a rapid fall.

One of the basic mechanism of radiation damage is production of free radicals ($O_2^-OH^-$ and H_2O_2) dealing to the formation of peroxides and oxidative reactive species. These peroxides via lipid peroxidation damage the cell membrane and other components of cell membrane damage caused by these reactive oxygen species which allow the entry of excess Ca^{2+} into cells by sequential biochemical and microanatomical cellular degranulation and necrosis by reducing this influex. Calcium channel blocker, diltiazem, used in the present study might prevent cellular injury due to membrane

impairment caused by inhibition of perfusion injury (Opie, 1982), and by direct inactivation of free radicals (Koller and Beregmann, 1989; Florsheim, 1993).

Glutathione (GSH) is a powerful detoxicant, and antioxidant and membrane stabilizer, which protects -SH bonds. the depletion of intracellular GSH has been found as one of the causes of radiation induced damage, whereas increased GSH level is responsible for radioprotective action. A similar mechanism of protection may be ascribed to anti-radiation effect of diltiazem which has exhibited to restore intracellular GSH level to normal, in animals exposed to gamma radiation. It is possible that diltiazem protects mice against radaitions induced injury and also is future aging by accelerating recovery process.

References

Bacq, Z.M. : La Cysteamine protector par voie oral centre be rayonnement. *Bull. Acd. Roy. Med. Belg*. 18, 426, 1953.

Baum, S.J., Wayant, D.E. and Vanger, J.P. : Comparative hematopoietic cytokinetics in X-ray or gamma neutron irradiated rats. *Am. J. Physiol.* 216, 582, 1969.

Daga, S.S., Jain, V.K. and Goyal, P.K. : Radioresponse of leucocytes in peripheral blood of mice against gamma irradiation and their protection by Liv. 52, *Probe, April-June* : 222-226, 1995.

Doherty D.G. and Bernett, W.J. : Jr. Protective effect of S-(amino-ethylisothiouranium Br. HBr.) and related compounds against X-irradiation death in mice. *Proc. Sec. Exptl. Biol. Med.* 89, 312, 1955.

Floresheim, G.L. : Radioprotective effects of calcium antagonists used alone or with other types of radioprotectors. *Radiat.* 133, 80-87, 1993.

Koller, P.T. and Bergmann, R. : Reduction of lipid peroxidation in reperfused isolated rabbit hearts by diltiazem. *Cir. Res.,* 65, 838-846, 1989.

Kumar, S., Joseph, C.D., Vosudevan, D.M. and Uma Devi, P. : Radiation induced peripheral blood changes in mice and its modification by MPG. *Radiobiol. Radiother.* 25, 591, 1984.

Kumar, S. : Studies of toxic effects of radiation and anticancer drugs in mammals. An approach for their prevention, *Proc. Acad. Environ. Biol.,* 2, 105, 1993.

Manda, K. and Bhatia A.L., : Melatonin's Anti-ageing role, A study on LPO in mice tissue. *Ind. J. of gerontology*, 16, 211-217, 2002.

Nunia, V. and Goyal P.K. : Radiation protection of bone marrow erythropoietic cells by diltiazem, *Journal of Medical Physics*, 27(3), 174-176, 2002.

Opie, L.H. : Perfusion injury and its pharmacology modification. *Circulation*, 80, 1049-1062, 1989.

Patt, H.M., Smith, D.E. and Jacksan, E. : The effect of cysteine on the peripheral blood of irradiated rats. *Blood* 5, 758, 1958.

Rubin, P. and Casarett, G.W. : In : *Clinical Radiation Pathology*. W.B. Saunders Philadelphia, 1968.

Samarth, R.M., Goyal, P.K. and Kumar, A. : Radioprotective activity of *Mentha piperita* (Linn.) against radiation induced alterations in peripheral blood of Swiss albino mice. *Radiation Protection and Environment*, Vol. 24, No. 1 & 2, Jan-June, 31-35, 2001.

Shekhawat, V.S. and Goyal, P.K. : Radioprotective effect of diltiazem against radiation induced variations in peripheral blood of Swiss albino mice. *Proceeding of fourteenth National symposium on Radiation Physics* (NSRP-14), 444-447, 2001.

Spalanger, G. and Cassen, B. : Eleatrophoretic mobility size distribution and electromicrograph response of lymphocyte to radiation. *Radait. Res*. 301, 22, 1967.

Sughara, T. Tananka, Y., Nagata, H., Tanaka T. and Kano E. : Radiation protection by 2-mercapto propionyl glycine. In : *Proc. Int. Symp. on Thiola,* Santen Pharmaceutical Co. Ltd. Osaka Japan p. 267, 1970.

Uma Devi, P. and Prasanna, P.G.S. : Radioprotective effect of combination of WR - 2721 and MPG on mouse bone marrow chromosomes. *Rad. Res*. 124, 165, 1990.

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Aging Brain : A comparison Between young and old male garden lizards in some biochemical parameters

K. Das

ABSTRACT

Age related changes were compared in biochemical constituents of the whole brain and mid-brain of male garden lizards. While no significant changes were observed in biochemical paraments of whole brain, significant differences were observed in mid-brain. Except in protein content, all the paraments (glucose, inorganic phorophorus, ascorbic acid, free amino acids, RNA and RNA / Protein) showed a decrease in contents when old mid-brain was compared with young mid-brain.

Keywords : Garden lizard, Aging, Brain tissue

Introduction

It is a general consensus among gerontologists that the mechanism of aging processes can be explained on the basis of changes at cellular level. Alterations in cellular functions may be a consequence of changes in biochemical composition of cells, since a number of enzymes and metabolites regulate the overall activities of the cells. Thus there is a correlation between the changes in cellular metabolism and biochemical composition in cells.

Most of the age related studies in cellular metabolism and biochemical composition of tissues so far have been confined to mammalian systems (Kohn, 1971). However if aging is a process,

fundamental to life, it is thought worthwhile to study some aspects of biochemical composition of brain tissue.

Materials and Methods

Male garden lizards of two different age group (younger and older) collected from Bhubaneswar localities were used. This species Calotes versicol or is a short-lived reptile with an approximate life spain of four years in the wild. The lizards were grouped as younger and older basing on various parameters which include the following :

1. **Body Weight :** The range of body weight of lizards included in younger group was 5.5 to 20 g and that of the older was 40.5 to 69g.
2. **Snout to Vent Length :** The range of snout - to - vent length in lizards included in younger group was 64 to 87 mm and that of the older was 104 to 120 mm.
3. **Maintenance :** After collection the lizards were maintained in wooden cages in the laboratory at room temperature for about a week, before being used for experimentation. They were fed goat liver on alternate days and tap water was provided *ad libitum*. For estimation of biochemical constituents - lizards collected from nature during January to April were used.

Preparation of tissue for biochemical analysis

After killing the lizards by a blow on the head, the whole brain was immediately transferred to beakers containing ice-cold Ringer solution (g/ Litre, Nacl. 6.5, Kcl - 0.25, $Cacl_2$ 0.3 $NaHco_3$, 0.2 pH 7.4). When mid-brain (optic lobes) was used, it was separated from the whole brain by a pair of fine forceps. The whole brain from a single individual of older age-group was adequate for biochemical analyses. But in younger age group, the whole brains from two individuals of approximately same size were pooled for analysis. Similarly mid brains from four individuals of younger age group and two individuals of older age-groups served as a set in the experiment.

Extractions and estimations of different biochemical constituents

After soaking in Whatman filter paper no. 40, tissues (whole brain and min brain) were quickly weighed in a monopan balance. A 5% TCA extract of the tissues was prepared after homogenizing in a

Scientronic (New Delhi) homozenizer and centrifuged for 30, minutes at 3,000 rpm. in a Hettich' as EBA III centri-fuge. Usually, the extraction was done twice with 4 ml. and 3.5 ml of 5% respectively and the supernatants were pooled. Samples from TCA extract were used for the colormetric estimations of the biochemical constituents.

The ascorbic acid was estimated following 2.4 dinitrophenyl hydrazine method with the modification that the samples were incubated at 57°C for 45 minutes as suggested of Tewary and Pandey (1965). The inorganic phosphorus in TCA extract was estimated following the colormetric method of fiske and Subbarow (1925). The glucose content in TCA extract was determined following the colorimetric method of Mendel et al. (1954). The TCA exact was neutralized with 2 N KOH solution methyl red as the indicator. The total free amino acid content of the neutralized sample was determined following the colorimethic method of Moore and Stein (1957).

The residue left after TCA extract was treated with 5 ml of 95% ethanol and the sample was left to stand at room temperature for 10 minutes. After centrifugation (10 minutes at 3,000 rpm) the supernatant was discarded and the residue treated with 5 ml. of either. The sample was again left at room temperature for 10 minutes. After centrifugation, the supernatant was discarded and the residue treated with measured volume (3 ml in case of whole brain, 1.5 ml in case of mid brain) of 0.3 N NaoH. The samples were incubated at 37°C for 1½ hour. After incubation each sample was cooled in ice cold water and equal volume of 10% TCA was added. After centrifugation, the supernatant was used for RNA analysis using the orcinol method as described by Volkin and Cohn (1954).

The residue was suspended in 1 ml. of distilled water and the protein content was estimated by the biuret method of Hiller *et al.,* as described by Oser (1965). Egg album in was used for the preparation of standard curve.

Results

Data on age changes in biochemical constituents have been presented in Table 1.

Table 1 : Age Change in Biochemical Constitutents

Age Group	Body weight (g)	S.V. Length (mm)	Glucose mg/100 g.	Inorganic phorphorus mg/100 mg	Ascorbic acid mg/100 g.	Free amino acids mg/g	RNA mg/g	Protein mg/g	RNA
				(A) Whole Braing					
Young	7-15	66-83	3.63±0.45 (13)	36.57±1.79 (13)	37.49±2.31 (13)	6.84±0.32 (8)	1.47±0.06 (13)	112.25±9.16 (13)	1.43±0.12 (13)
Level of Significance (P)			<0.10	<0.10	NS	<0.10	NS	NS	<0.10
Old	45-63	110-117	3.05±0.34 (11)	33.83±1.29 (11)	33.23±180 (11)	3.42±0.37 (11)	1.34±0.07 (10)	115.35±2.92 (9)	1.14±0.06 (9)
				(B) Mid Brain					
Young	8-15	71-83	6.25±0.76 (6)	37.06±2.41 (7)	38.57±2.13 (6)	4.86±0.73 (7)	1.32±0.05 (8)	113.28±3.42 (8)	1.17±0.05 (8)
Level Significance (P)			< 0.01	<0.05	< 0.01	< 0.01	< 0.01	NS	< 0.05
Old	45-61	107-116	2.68±0.31 (9)	30.75±2.05 (9)	25.68±1.74 (10)	2.16±0.33 (10)	1.02±0.06 (10)	93.25±11.13 (10)	0.98±0.06 (10)

All values are average ± SEM

(a) **Glucose :** The glucose - content (mg/g wet wt.) of the whole brain of lizards of the older age group was marginally lower than the content in the whole brain of lizards of the younger age group. But the results were not statistically significant. The glucose content in the mid-brain (mg/g/ wet wt) of lizards of the older age group was lower than that in lizards of younger age group ($P<0.01$).

(b) **Inorganic phosporous :** The content of inorganic phosphorus in whole brain (mg/100 g wet wt.) of lizards did not show a significant effect of age. In mid brain, the inorganic phosphorus content (mg/100 wet wt.) declined significantly with age ($p < 0.5$).

(c) **Ascorbic acid :** The ascorbic acid content of whole brain (mg/100 g wet wt.) did not show significant age difference. In mid brain the relative ascorbic acid content declined significantly with age ($p <0.05$).

(d) **Free amino acids :** The free amino acid content (mg/ g wet. wt) of whole brain did not show a significant age-related decline.In mid brain also the relative free amino acid content declined with advancing age ($p < 0.01$).

(e) **RNA :** There was no significant age difference in relative (mg/g wet/ wt) RNA content of whole brain.Unlike in whole brain, the relative RNA content of mid brain declined significantly with advancing age ($p <0.01$).

(f) **Protein :** Neither in whole brain nor in mid brain, the protein content showed a significant change with age.

(g) **RNA/Protein Ratio :** In whole brain this did not show a significant effect of age. On the other hand, in mid-brain, the RNA/ Protein ratio on the basis of relative value declined significantly with advancing age ($p<0.05$).

Discussion

The biochemical; constituents showed differential aging patterns in whole brain and mid brain of garden lizards.

In contrast to any other tissues, the brain tissue is almost completely dependent on carbohydrates for its energy source

(Bachelard, 1970). About 25% of the total bodily consumption of oxygen in mammals is utilised by the brain tissue. In vivo condition, glucose has been confirmed to be the only satisfactory metabolic support for brain. Because of high metabolic rate, the brain tissue has very little fuel reserve and for that reason the glucose or glycogen content is very low. These studies suggest the importance of glucose in the metabolism of brain tissue. That in older garden lizards, the glucose content of mid brain is significantly lower than those of the younger lizards may suggest that during the aging of brain tissue, the transport of glucose from blood to brain is deranged. Since the metabolism of glucose is low in older mid brain tissue (Padhi, 1976) the low glucose content can not be considered due to its greater utilization. Since the glycogen content of liver (Rao, 1974), muscle (Hageeb, 1975) and blood glucose level (Patnaik, unpublished date) are low in older lizards, it is believed that the transport of glucose from blood to brain is disturbed during aging of male garden lizard. As carbohydrate metabolism in brain is connected with cerebral activities (transmission of nerve impulse, migration of ions utilisation of energy etc.) the decrease in the glucose level in mid brain of aging garden lizard may have implications on these characteristics. Our findings on changes in glucose level are comparable with the findings of Market *et al.* (1973) that the glucose level did not change significantly during maturation but during aging the cortical layer showed lower glucose concentration.

The inorganic phosphate may limit the rate of respiration in brain tissue. The relative inorganic phosphorous contents of garden lizard mid brain declined with advancing age. This might limit the respiratory rate of brain tissue of aged lizards as observed in Oxygen consumption studies. The possibility that the low content of inorganic phosphorous in aged garden lizard brain may be due to transport derangement can not be ruled out.

Ascorbic Acid

Ascorbic acid may play a significant role in cellular oxidation reduction reactions (King, 1950). Decrease in ascorbic acid content of various tissues of rat including the brain was correlated with declining rate of synthesis in liver (Patnaik, 1971). Since the synthesis of ascorbic acid in kidney of garden lizard declines with age (Padhi and Patnik, unpublished date) and the fact that the relative

content in mid brain of older garden lizards was low might be correlated with each other. If the role of ascorbic acid in the cellular respiration is certain than the low content in mid brain of older lizards might be correlated with lower rate of respiration in aged mid brain of older lizards might be correlated with lower rate of respiration in aged mid brain homogenate.

Free amino acid

The importance of amino acids in brain tissue is well known. Some of the amino acids may act as neurotransmitters (excitatory and inhibitory) and some others may take part in termediary metabolism. Besides these, the participation of amino acid in protein synthesis is a generalised function. In garden lizard, the relative/free amino acid content of mid brain declined with advancing age. These changes may have several implications on the brain tissue metabolism. The low content in order lizards may be due to lower rate of transport from blood during aging. Since the RNA/ protein ratio, an indicator of the rate of the protein synthesis, declines with advancing age, it may be a fact that the rate of protein synthesis in older lizards is lower due to limitation of free amino acid pool imposed by restricted transport through blood brain barrier. In mammalian brain, changes associated with amino acids during aging differed among brain areas (Timiras *et al.* 1973). Oeiru and Tanase (1963) also observed differential pattern of age changes in brain areas of rat. But considering the observations of Timiras *et al.* (1973) in rat brain areas, our results in garden lizard mid brain tissue may seem comparable in that the free amino acids pool declines with age. Finch *et al.* (1975) also showed that the uptake of amino acids by mouse brain slices declined with advancing age. The level of some free amino acids in the cerebrospinal fluid of human being have been reported to decline in aged individuals (Gjessing *et al.,* 1974).

These studies on amino acid metabolism of brain tissuse of reptiles and mammals suggest that significant alteration in the free amino acid pool might influence the general metabolism of aging brain tissue, more particularly the protein synthesis.

Protein

Estimation of relative protein content in a tissue may give a rough estimate of protein synthesis (Hrachovec, 1991). That the rate

of protein synthesis in mouse brain declines with age was reported by Lerner and Johnson (1970). Hollander and Barrows (1968) did not find any significant age change in the protein contents of rodent brains. The protein content of the cerebellum and hipocampus of mouse brain remained stable during aging (Vijayan, 1977). The absolute protein content in mouse whole brain (Franks *et al.,* 1974) and rat brain regions (Von. Hahn, 1966) remained constant during adult and senescent phase. Winick (1968) reported that the protein content of human brain increased linearly between 13 weeks of gestation and 13 months of age.

These results suggests that the protein content in mammalian brain accumulates during maturity, remaining almost constant thereafter. The findings revealed on significant change in relative protein content of mid brain of garden lizard. However there is no correlation between changes in the protein content and RNA / Protein ratio.

RNA

RNA content indicates the intensity of protein synthesis in a tissue (Brachet, 1955). In mammals, loss of RNA (per wet wt. or per mg. protein) in whole brain (Devi et al. 1963) cerebral hemaphere 'Vonhahn, 1966 and Adams, 1966) and other brain regions (Himwich, 1973) during maturity has been reported to be due to decline in the number of polysomes (Murthy, 1966). In mid brain of garden lizard the relative RNA contents declined significantly during aging suggesting a decline in intensity of Protein synthesis.

RNA / Protein Ratio

This ratio is also considered to indicate the rate of protein synthesis in a tissue. In some mammalian tissues, this ratio declines with age (Harchovec, 1971). The results indicate that this ratio in garden lizard mid brain declines with advancing age, suggesting that the rate of protein synthesis in mid brain tissue might be declining with advancing age.

Thus from the above studies, it seems that as compared to whole brain, the mid brain tissues of male garden lizard show definite age - changes in a majority of biochemical components. The mid brain in reptiles is an important coordination centre and performs functions

analogous with those of cerebral cortex in mammals (Bellairs & Attridge, 1975).

A majority of changes are comparable to the earlier findings in central nervous system aging of mammals. It seems therefore that the age changes in biochemical parameters of the brain of a poikiloghermic vertebrate are not very much different from those observed in the brain of homeotherms.

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References

A dams D.H. *Biochem. J.* 98 : 636, 1966.

Bellairs A.D.A. and Attridge J. In *Reptiles* (series Ed. A.J. Cain). Hutchinsons University Library, Landon, pp. 58, 1975.

Brachet J. (1955) In *The Nucleic Acids* Vol. II, Academic Press N.Y.

Frank L.M., Wilson, P.D. and Whelan, R.D. The effect of age on total DNA and Cell number in mouse brain. *Gerontologia*. 20 : 21-26, 1974.

Finch. C.E. Jonec. V. Hdy., G. and Walker J.P. Aging and the passage of L-Thyrosoine, L-Dopamine and Insulin into mouse brain slices in vitro. *M.J. Geront.* 30 : 33-40, 1975.

Fiske C.H. and Sabbarow. Y. The colorimetric determination of phosphorus. *J. Biol. Chem.* 66 : 375, 1925.

Gjessing L.R. Gjesdhal, P. Diltrichson. P. and Presthus. J. FAA in the cerebrospinal fluid in old age and parkinson's diseases. *Eur. Neurol.* 12 : 33 - 37, 1974.

Himuwich, W.A. *Problems in interpreting neuro-chemical changes occuring in developing and ageing animals* (Ed. D.H. Ford) Elsevier, Amsterdam. PP. 13, 1973.

Hollander, J. and Barrows, C.H. Enzymatic studies in senescent rodent brain. *J. Geront.* 23 : 174-179, 1968.

Hrachovec. J.P. The effect of age on tissue protein synthesis. Age changes in amino acid incorporation by rat liver purified microsomes. *Gerontologia* 17 : 75-86, 1971.

Kohn, RR. *The Principles of Mammalian Ageing*. Prentice Hall, Engleword Cliffs. U.S.A. PP. 138-139, 1971 .

Lerner M.P. and Johnson, T.C. Regulation of Protein synthesis in developing mouse brain tissue. *J. Biol. Chem.* 245 : 1388-1393, 1970 .

Murthy M.R.V. Biochem, Biophys. *Acta.* 119-586, 1966.

Moore. S. and Stein W.H. In *Methods in Enzymology* Ed. S.P. Colowick and N.O. Kalplan. Academic Press N.Y. Vol. 3 PP. 467, 1957.

Mendel B. Keny A. and Myers. D.K. Colorimetric micromethod for the determination of glucose. *Biochem. J.* 56 : 639-646, 1954.

Oeiru, S. and Tanase I. *Rev. Franc. Gerontol.* 181 : 255, 1963.

Patnaik B.K. Age - related studies on Ascorbicacid metabolism. *Gerontologia* 17 : 122-128, 1971.

Tewary C.P. and Pandey G.C. Further studies on the 2-4 dinitrophenyle hydrazine method of Roe and Kuether for the estimation of ascorbic acid, dehydroascorbic acid and diketo gulonic acid, *Indian J. Biochem*. 1 : 171, 1965.

Timiras P.S., Hudson B.B. and Oklund. S. Changes in CNS free amino acids with development and ageing. In *Neurobiological aspects of Maturation and ageing*. (Ed. D.H. Ford.), Elsevier, Amsterdam, pp. 267, 1973.

Volkin. E. and Cohn. W.E. Estiamtion of nucleic acid.In Methods of Biochemical analysis (Ed. D. Glick) *Inter Science*, N.Y. Vol. I. pp. 287-386, 1954.

Vijayan V.K. Cholinergic enzymes in the cerebellum and hippocampus of the senescent mouse. *Exp. Geront.* 12 : 7-11, 1977.

Von Hahn H.P. Distribution of DNA and RNA in the brain during life span of the albino rat. *Gerontologia* 12 : 18-29, 1966.

Winick. M. Changes in nucleic acid and protein content of the human brain during growth. *Pedait Res.* 2 : 352-355, 1968.

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Dietary Supplementation of Spinach Improves Learning and Memory in Mice against radiation Induced Oxidative Stress

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ABSTRACT

Free radicals formation is greatly augmented during exposure to ionizing radiation which causes damage in cerebellum responsible for locomotor activity. Healthy Swiss albino mice (6-8 weeks) were selected from inbred colony and initial training for 15 days was given to all the mice in Hebb William Maze; model D[1] to study learning ability. They were gavaged with alcoholic and water extract of Spinacia oleracea (SE) at the dose of 1100 mg/kg-body wt./day for fifteen consecutive days orally before exposure to 5 Gy of gamma radiation from ^{60}Co beam therapy unit. Time taken by mice to reach from chamber A to chamber B (containing food) was recorded in all the groups. The results indicate that supplementation of spinach diet before exposure improves learning in the maze. These data to indicate that nutritional intervention by spinach may reverse radiation induced deficits in learning and memory to an extent.

Keywords : Learning, Memory, Radiation, Oxidation stress.

India has a rich heritage of medicinal plants many of which have been explored for the various bioactivities since ages. However, the radioprotective potentials of the plants have not been explored adequately, though a large number of compounds from various plant sources have been shown to possess antioxidant properties (Grow-chin *et al*., 1996). There is clear evidence that consumption of fruits and vegetables is beneficial to health. Much of the evidence supporting the protective role of fruits and vegetables comes from

epidemiological literature. The nature of the protective effects of the specific nutrients found in fruits and vegetables, such as β-carotene, vitamin C and vitamin E is not yet clearly known. Recent studies with vitamin E indicates that high dose can slow the progression of Alzheimer's disease (Sano *et al.,* 1997). With few exceptions, however a single nutrient is not packaged into a single food and the combination of nutrients found in foods might have greater protective effects than each nutrient alone.

Diets high in antioxidant properties are known to reverse some deficits in neuronal and cognitive function that occur in aging animals. Antioxidants are also known to reduce levels of proinflammatory factors in the CNS. It is known that there are a number of neuronal and behavioral changes that take place as a result of oxidative stress (OS) produced by radiation. These changes may include decrements in calcium homeostasis (Landfield,1994) and in the sensitivity of several receptor system, most notably, (a) adrenergic (Gould, 1997) (b) dopaminergic (Joseph, 1990, Levine, 1998) (c) muscarinic (Joseph,1990, Yafu,1994, Egashria,1996) and (d) opiod (Kornhuber,1996,Nagahara,1996). This decrement can be expressed, ultimately as alterations in both motor (Joseph,1983, Kluger,1997) and cognitive behaviors (Bartus,1990).

Spinacia oleracea (English - Spinach, Hindi- Palak) is a common herb, native of South Asia. Spinach leaves are eaten as vegetable and is reported to be a good source of minerals, vitamin B-complex, vitamin K, ascorbic acid, carotene (β-carotene, lutein, zeaxanthin), protein content (2.0 % per 100 gm of edible protein) and flavonoids, all of which have been shown to possess antioxidant properties (Gopalan, 1996, Ferreres, 1997). Recently studies reported the presence of a series of water soluble powerful natural antioxidants in spinach leaves extract and their biological activities were described (Grossman, 1994, Zurovsky, 1994, Zurovsky,1995, Lomnitski, 2000a).

Studies have shown that spinach improves cerebellar physiology and motor learning in aged rats (Bickford, 2000). A reversal of age-related decline in neuronal signal transduction, cognitive and motor behavioral deficits with Blueberry, Spinach or Strawberry dietary supplementation has also been recorded (Joseph,1999). Therefore, it is possible that nutritional intervention

by increasing intake of phytoantioxidants may reduce threat of free radicals produced as a result of radiation exposure and also aging. Although the major factors involved in these age-related declines remain to be specified, a great deal of research in recent years has suggested that one of the most important may be reductions in the ability to mitigate the long- term effects of OS.

If OS is indeed a major factor in brain aging and in age-related neurodegenerative disease, it would seem that some of its deleterious effects could be retarded or even reversed by increasing antioxidant levels, and the synergistic effects of combinations of antioxidants might be particularly effective in the regard. Hence, this work focuses on *Spinacia oleracea*, a rich phytoantioxdant and its effect on mice brain and learning against deleterious effect of radiation and possibly aging.

Materials and Methods

Animals : Thirty healthy Swiss albino mice (6-8 weeks old) of both the sexes, weighing 22±3gm from an inbred colony were selected for each group and maintained under controlled conditions of temperature (25± 2^0 C) and light: dark; 14hr.:10hr. They were fed with balanced food in the form of pellets manufactured by Hindustan Lever Ltd., Mumbai and water was provided *ad libitum*.

Extract Preparation: Fresh *spinach* leaves [*Spinacia oleracea* Linn. RUBHL No*-19867] collected locally were air dried, powdered and extracted with methanol by refluxing for 48 hr. (16hr. x 3) half a kg spinach yields about 100 gm powdered form when dried and this dried powder yields 20gm crude methanolic extract, which is dissolved in double distilled water (DDW) just before oral administration.

Source of radiation: The cobalt teletherapy unit (ATC-C9) at cancer treatment center, Radiotherapy Department, SMS Medical College and Hospital, Jaipur was used for irradiation. Unanaesthestized animals were restrained in well-ventilated boxes and exposed to whole-body 5 Gy gamma radiations at the dose rate of 1.071 Gy/min at the source to surface distance of (SSD) 77.5 cm.

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* Rajasthan University Botany Herbarium Library, where the plant was identified by a taxonomist in consultation with experts and given the plant number.

Hebb William's Maze: All of these animals were initially trained in Hebb William's Maze, model D^1- a maze system which consists of passages where only one leads to the goal while other comes to a dead end. In such experiments an essential feature for learning is the number of trials, which an animal takes to find the goal without error. Visual sense is not important in learning the path, as it has been demonstrated that blind rats learned the maze quickly as normal ones. In the same manner the anosmic rats learned the maze as quickly as normal. It can be stated that animals use a combination of cues from different senses to reach the goal, and hence to learn the maze. It is apparent that maze provided a learning task sufficiently sensitive to detect behavioral aberrations. It is important to establish the validity of this instrument as a measure of sensory, motor and central nervous system function.

Experimental Design

The mice were divided into four groups as follows:

Group 1 (Normal) : Animals of this group did not receive any treatment and served as normal.

Group 11 (Drug) : Animals of this group were supplemented orally with 1100 mg/kg b.wt./day of spinach extract for 15 days.

Group 111(Control) : The animals in this group were given DDW for 15 days and exposed to 5 Gy whole-body irradiation at the dose rate of 1.137 Gy or 113.7 /min.

Group 1V (Exper.) : The mice in this group received *spinach* extract for fifteen days prior to exposure with 5 Gy of gamma radiation at the dose rate of 1.137 Gy or 113.7/min.

Time taken by mice to reach from chamber A to chamber B (containing food) was recorded in all the groups. Initial training of mice was undertaken for fifteen days before diet supplementation and gamma irradiation Protein and GSH estimation were carried out in brain by methods as proposed by Lowry, (1951) and Moron, (1979) respectively.

Results

Fig.1 depicts the learning in mice reflected by time (sec.) to reach the goal with the passage of time in normal and during spinach extract (SE) administration. Mice, which were supplemented with SE, took significantly lesser time to reach to their goal than normal upto 15 days, as shown by a diagonal trend (regression coefficient has been very close to 1 i.e. above 0.8). Mice treated with 1100 mg/kg.b.wt./day showed better learning behaviour as compared to normal as well as other groups. Control mice (only irradiated) showed continuous decline in their learning performance as evident by a constant increase in time to reach the goals. However, spinach supplemented diet fed mice took lesser time *i.e.* showed better performance than those of control. Though recovery was indicated in control from day 15 and onwards, however, in spinach supplementated group (experimental) the deficit in learning was completely reversed by the last interval studied *i.e.* day 30.

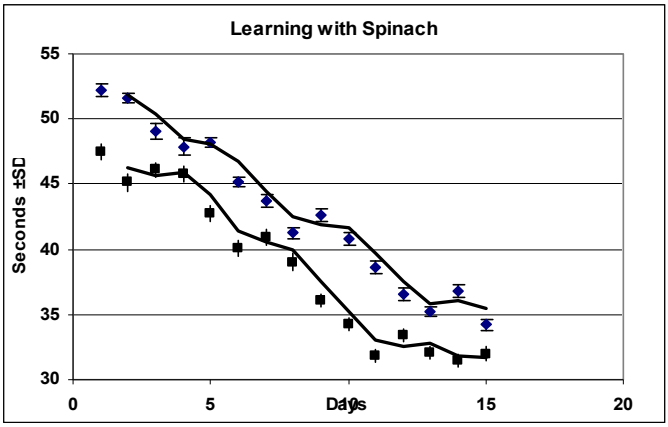

Fig. 1 : Time (sec.) to reach to goal in mice with the passage of time in normal and during spinach extract (SE) administration.

There was a continous reduction in protein content up to day 7th *post-irradiation* followed by an increase at later intervals in both the groups (control and experimental). The values of the protein content in the experimental group (SE+IR) are significantly higher ($P<0.001$) than corresponding control (irradiated) mice at all the post-irradiation intervals. At day 30 in the experimental group, protein content reached almost normal level (98.62%) but in the control

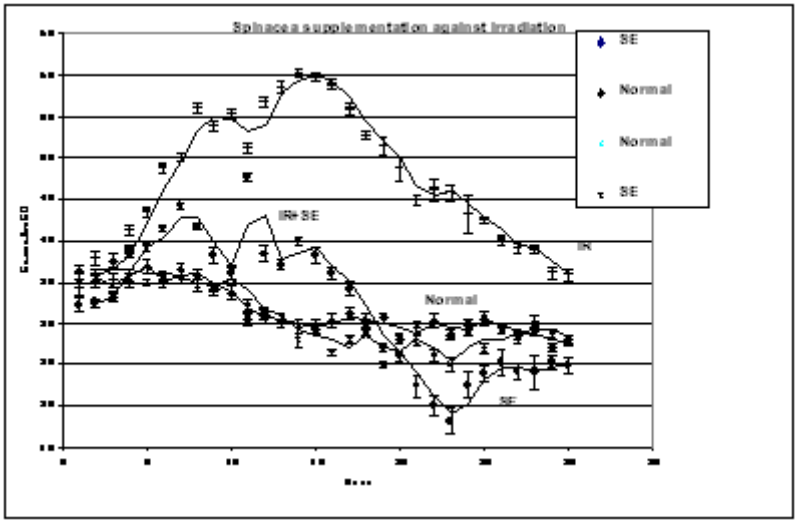

Fig. 2 : Time (sec.) to taken by 15 days Spinacia oleracea extract pre-treated and trained mice to reach to goal after gamma radiation exposure (5 Gy).

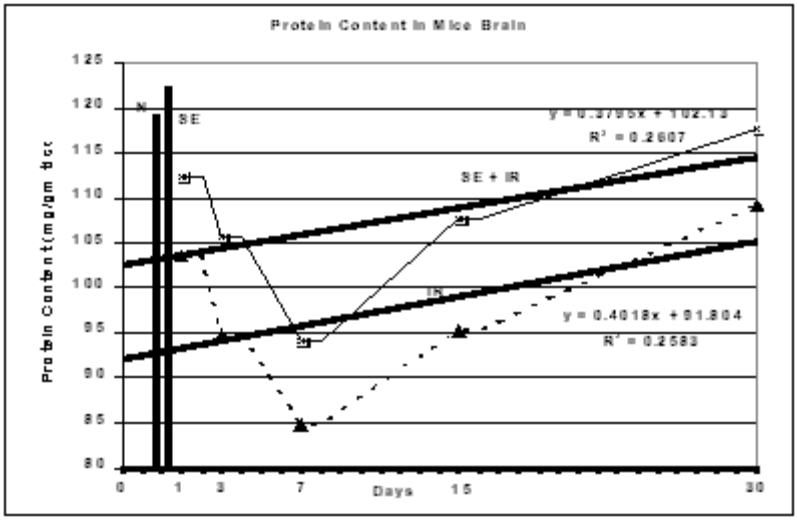

Fig. 3: Protein concentration in whole brain with the passage of time in normal mice and in mice after spinach extract (SE) administration with and without radiation exposure (5 Gy).

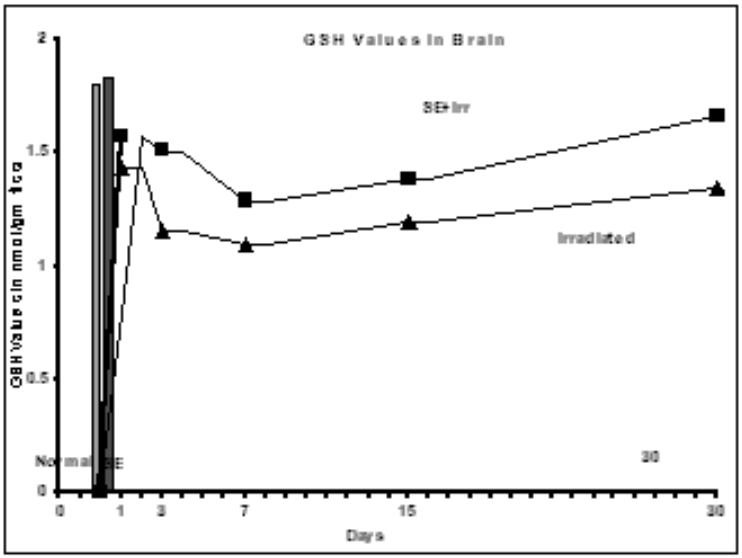

Fig. 4: GSH level in whole brain with the passage of time in normal mice and in mice brain after spinach extract (SE) administration with and without radiation exposure (5 Gy).

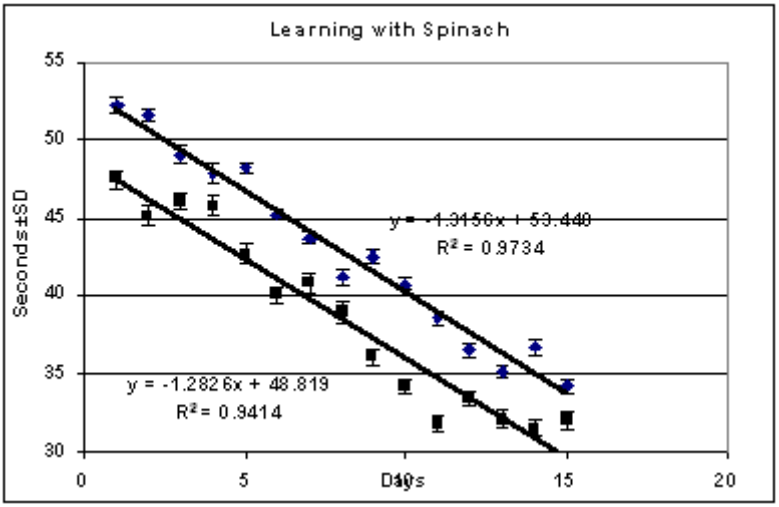

Fig. 5 : Linear trends of time to reach to goal in sec. depicting the tendency of the learning of 15 days trained mice during daily administration of spinacia oleracea l. extract orally.

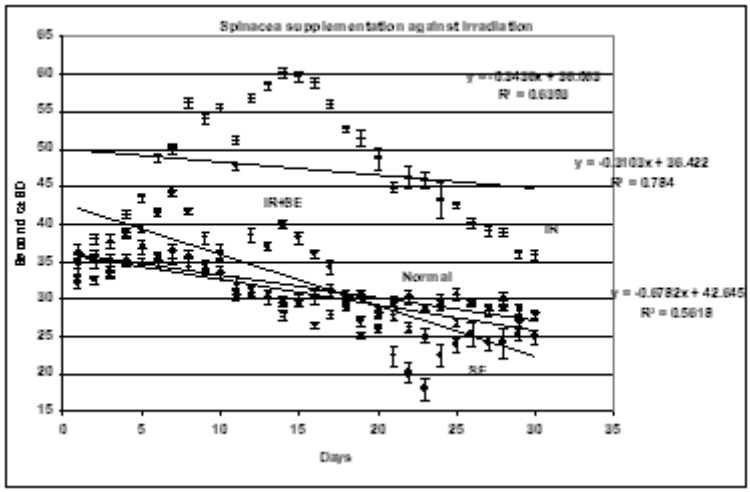

Fig. 6 : Linear trends of time (sec.) taken by day *Spinacia oleracea* L. pre treated and trained mice after gamma radiation exposure.

group it was 91.5% of the normal (Fig.3). Total glutathione levels were increased in experimental group after diet supplementation with spinach (Fig. 4). The values of glutathione levels in brain were lowered by 25.56% in control and 7.77% in experimental group, respectively at day 30 post-irradiation.

Discussion

Above findings suggest that supplementation of spinach improves the learning ability of mice as compared to the normal. After irradiation too damage was less and recovery was evident in experimental group (SE+IR) as compared to control (IR) group measured in terms of learning. The results indicate deficit in learning ability, which is indicated by the increase of time taken by mice to reach the goal after exposure to radiation initially till 15 days. However, learning improves till the last interval studied. Supplementation of spinach diet before exposure improves learning in the maze. These indicate that nutritional intervention by spinach

may reverse radiation-induced deficits in learning and memory to an extent.

Radiation causes free radical induced damage in the brain but these free radical changes were less in *Spinacia* supplemented mice and they sustain the learning ability even after irradiation and it might be due to less damage to brain of *Spinacia* supplemented mice and may be attributed to antioxidant property of *Spinacia* which is one of the carotene rich foods available round the year.

Irradiation is associated with a decline in motor coordination, which leads to deficit in the ability to learn new motor skills. This loss of function might be correlated with decline in cerebellar beta-adrenergic receptor function. The exogenous oxidative insult result in a decline in cerebellar beta-adrenergic receptor function that resembles what is observed in normal aged rats. This effect of hyperoxia is blocked by antioxidants (Bickford *et al*., 1999). Bickford *et al.* (2000) reported that diets supplemented with spinach, strawberries, blueberries, nutritional antioxidants, reverse age induced declines in beta–adrenergic receptor function in cerebellar purkinje neurons measured using electrophysiological techniques. The spinach diet improved learning on a run way motor task, previously shown to be modulated by cerebellar norepinephrine.

Further, Cartford (2002) demonstrated that 6 weeks of a spinach-enriched diet ameliorates deficits in cerebellar-dependent delay classical eyeblink learning and reduces the proinflammatory cytokines tumor necrosis factor alpha (TNFalpha) and TNFbeta in the cerebelli of eyeblink-trained animals. Eighteen-month-old Fischer 344 rats were given spinach-enriched lab chow or regular lab chow for 6 weeks. The rats were then given 6 d of 30 trials per day training using a 3 kHz tone conditioned stimulus and airpuff unconditioned stimulus. Rats were killed 3 weeks after eyeblink training. Cytokine expression was measured using RNase protection assay analysis in the eyeblink-trained animals and in a group of young control animals given regular lab chow diet. Old animals on the spinach-enriched lab chow diet learned delay eyeblink conditioning significantly faster than old animals on the regular diet. Cerebelli from older animals on the spinach-enriched diet had significantly less TNFalpha and TNFbeta than cerebelli from older animals on the control diet.

Ample research indicates that age-related neuronal behavioral decrements are the result of oxidative stress that may be ameliorated by antioxidants. Joseph *et al.* (1999) showed that rats given dietary supplements of fruit and vegetable extracts with high antioxidant activity for 8 months beginning at 6 months of age retarded age-related declines in neuronal and cognitive function. The supplements of strawberry, spinach, or blueberry extract were also effective in reversing age-related deficits in several neuronal and behavioral parameters. These findings suggest that, in addition to their known beneficial effects on cancer and heart disease, phytochemicals present in antioxidant-rich foods may be beneficial in reversing the course of neuronal and behavioral aging.

More relevant to brain, research has shown that the CNS may show an enhanced vulnerability to oxidative stress, since it is deficient in free radical protection and use 20% of the total body oxygen (Olanow, 1992) and this vulnerability may increase further in aging (Joesph,1983). This OS increase in vulnerability may be the result of increase in the ratio of oxidized to total glutathione or alterations in membrane lipids (Denisova, 1998).

Several studies have suggested that these increase in OS vulnerability and resulting behavioral deficits in aging can be reduced through dietary supplementation with Ginkgo biloba, for example memory impairment (Rai, 1991), difficulties in concentration (Kleijen, 1992a, 1992b) and calcium induced increase in oxidative metabolism (Oyama, 1992,1993) can be reduced by this supplement. In addition, recent studies have also suggested that garlic extract can prevent brain atrophy (Moriguchi, 1997), as well as learning and memory impairments (Nishiyama, 1997) in the senescence acceleterated mouse. Decreased brain GSH levels have been reported in neurodegenervative diseases such as Parkinson's and Alzheimer's disease in which oxidative processes contribute to the pathology (Jenner,1996; Sen, 1999). These findings suggest that GSH may also have importance for the cognitive functions of the CNS. Glutathione (GSH) is involved in the response all oxidative stressors (Shukitt-Hale, 1998a, 1998b). Thus the effect of the glutathione levels was measured in the brain. Recently, (Ferreres, 1997) isolated and identified five novel naturally occurring

flavonoids from spinach leaves. Flavonoids are typical phenolic compound and powerful chain breaking antioxidant (Lea,1956, Hughes *et al.,*1977, Torel,1986, Pratt,1992, Clemestson, 1996). It was reported that LPO could be inhibited by flavonoids, possibly through their activity as strong O_2^- scavenger (Bauman, 1998b) and singlet oxygen quenches (Sorata, 1984).

It has long been shown that protein synthesis can occur in neuronal dendrites, but its significance remained unclear until recently. Studies suggest that local protein synthesis has crucial roles in synaptic plasticity, the change in neuronal communication efficiency that is probably a cellular basis of learning and memory. Induced by neuronal activity, local protein synthesis provides key factors for the modification of activated synapses. Memories are laid down in our brain via chemical changes at the neuron level. An understanding of the neurobiology of memory may stimulate health educators to consider how various teaching methods conform to the process of memory formation.

Learning ability is always the formation of new protein molecules. Decrease in the protein content after exposure to radiation has been reported by Verma, (2002) which might be due to either decline in the rate of protein synthesis or an increase in the protein consumption. The reduction in the protein biosynthesis could be attributed to any of the following factors: (a) activation of RNAase (b) depletion of mRNA or (c) effect on the formation and/or maturation of RNAase. Radiation may also include local defects in the microstructure of protein molecules, which becomes center of thermal denaturation and cross linkage, thus causing tissue damage (Ord, 1956, Uchiyama, 1966, Markarchenko *et al.,* 1968).

Increase in protein concentration in experimental group is assigned as the compensation beneficial effect. Brahmi was also found to reduce the stress-induced adverse effect in discrimination learning (Agarwal, 1993). Van Stuijvenberg, (1999) reported that people aged 65 and older, having higher ascorbic acid and beta-carotene plasma level showed better memory performance. Van Stuijvenberg, (1999) reported that fortified biscuits (made from iron, iodine and beta carotene) resulted in a significant improvement in the mental development and learning ability in school children.

However, the finding from this research suggest that nutritional intervention with spinach may play in important role in reversing the deleterious effect of radiation on neuronal function and behaviour.

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References

Agarwal A, Gupta V, Dixit SP, Dubey GP. Change in brain biogenic amines under the influnce of an Ayurvedic drug, Brahmi and its effects on discrimination learning. *Pharmacopsychologia*. 6:15-19, 1993.

Bauman J, Wurm G, Von Bruchhausen F. Postglandian synthetase inhibition by flavonids and phenolic compounds in relation to their O^{2-} scavenging properties. *Arch. Pharm*. (Weinheim) 313: 330-337, 1998b.

Bhattacharya SK, Satyam K, Ghosal S. Antioxidant activity of glycowithanolides from *Withania somnifera* . *Ind. J. Expl. Biol*. 35: 236-239, 1996.

Bickford PC, Gould TL, Briederick, Chandma L K, Pollock A, Young D, Shukitt-Hale B, Joseph J. Antioxidant-rich diets improve cerebellar physiology and motor learning in aged rats. *Brain Res.* 866 (1-2) : 211-217, 2000.

Bartus RT. Drugs to treat age related neurodenenerative problems. The final frontier of medical science. *J. M. Geriat. Soc.* 38 : 680-695, 1990.

Bickford PC, Shukitt-Hale B, Joseph J. Effect of aging on cerebellar noradrenergic function and motor learning nutritional interventions, *Mechanisms of Aging and development*. 111 (2-3): 141-154, 1999.

Cartford MC, Gemma C, Bickford PC. Eighteen-month-old Fischer 344 rats fed a spinach-enriched diet show improved delay classical eyeblink conditioning and reduced expression of tumor necrosis factor alpha (TNFalpha) and TNFbeta in the cerebellum. *J. Neurosci.* 22 (14): 5813-5816, 2002.

Clemetson CA, Anderson L. Plant polyphenols as antioxidants for ascorbic acid. *Ann. N. Y. Acad. Sci.* 136: 341-376, 1996.

Denisova NA, Erat SA, Kelly JF, Roth GS. Differential effect of aging on cholesterol modulation of carbachol stimulated Low-km GTPase in striatal synaptosomes. *Exp. Gerontol.* 33: 249-265, 1998.

Egashira T, Yamanka FY. Effect of Biofemelane on muscarinic recptors and choline acetyltransferase in the brains of aged rats following chronic cerebral hypopefusion induced by permanent occulusion of biateral carotid arteries. *Jpn. J. Pharmacolo.* 72: 57-65, 1996.

Ferreres F, Castaner M, Tomas-Barberan FA. Acylated flavonal glycosides from spinach leaves (*Spinacia oleracea*). *Phytochemistry*, 45 (8): 701-1705, 1997.

Grossman S, Rezink R, Tamari T, Albeck M. New plant water soluble antioxidant (NAO) from spinach. In: Asada, K Toshikawa T (Eds.), *Frontiers of reactive oxygen species in Biology and Medicinal*. Elsevier Science, Amsterdam, The Netherlands; 343-344, 1994.

Gopalan C, Sastri RBV, Balasubramanian SC. *Nutritive value of Indian foods*. National Institute of Nutrition I.C.M.R., Hyderabad. 1-156, 1996.

Gould TJ, Bicford P. Age related deficits in the cerebellar alpha-adrenergic signal transduction cascade in fisher 344 rats. *J. Pharmacology Exp.* Ther. 281 : 965-971, 1997.

Hughes RE, Wilson HK, GP In: Ellis, West GB (Eds.). *Progress in medicinal chemistry*, Elsevier, Amsterdam : 285-301, 1977.

Jospeh JA, Shukitt-Hale B, Denisova NA, Bielenski D, Martin A, Mc Ewen JJ, Bickford PC. Reversals of age-related decline in neuronal signal transduction, congnitive and deficits with blue berry, spinach or straw berry dietary supplementation. *Neuroscience.* 19 (18) : 8114-8121, 1999.

Joseph JA, Bartus RT, Clody DE, Morgan D, Beer B, Seack S. Phychomotor performence in the senescent rodent reduction of deficits via striatal dopamine receptor up-regulation. *Neurobiol.* Aging. 4:313-319, 1983.

Joseph JA, Villalobos-Molina R, Denisova N, Erat S, Culter R. Strain Age differences in sensitivity to H_2O_2- or No- induced reductions in K^+ evoked dopamine release from super fused slrital reversuls by PBN or Trolox. Free Radic. *Biol. Med.* 20 : 821-830, 1996.

Jenner P. Oxidative stress in Parkinson disease and other neurodegenerative disorders. *Pathol. Biol.* 44: 57-64, 1996.

Joseph JA, Maki MAT, Roth GS. Selective cross activation/ inhibition of second messenger systems and the reduction of age-related deficits in

the muscarinic control of dopamine release from perifused rat striata. *Brain Res.* 537: 40-48 , 1990.

Kornhuber J, Schoppmeyer K, Bending C, Riedere P. Characterization of [3H] pentazocine binding sites in post-mortem in human frontal cortex. *J. Neural. Transm.* 103 : 45-53, 1996.

Kluger A, Gianutsos JG, Golomb J, Ferris SH, George AE, Frannssea E, Reisberg B. Patterns of motor impairment in normal aging mild congnitive decline and early Alzheimers disease. *J. Gerontol.* 52 : 28-39, 1997.

Kleijen J, Khipschild P. *Ginkgo biloba*. *Lancet*, 340: 1136-1139, 1992a.

Kleijen J, Khipschild P. *Ginkgo biloba* for cerebral insuliency. *Br. J. Clin. Pharmacological*. 34 : 352-358, 1992b.

Lea CH, Swoboda PA. Antioxidant of flavonids, gossypetin and quercetagetin. *Chem. Ind.* 1426, 1956.

Landfield PW, Eldridge JC. The glucocorticoid hypothesis of age related hippocampal neurodegeneration role of dysegulated intraneuoral Ca^{2+}. *Ann. Ny. Acid. Sci.* 746 : 308-321, 1994.

Lomnitski L, Carbonatto M, Ben-Shaul V, Peano S, Conz A, CorradinL, Maronpot RR, Grossman S, Nyska A. The prophylactic effects of natural water soluble antioxidant from spinach and apocynin in a rabbit model of lipopolysaccharide induced endotoxemia. *Toxicol. Pathol.* 28: 588-600, 2000a.

Levine MS, Cepeda C. Dopamine modulation of response mediated by excitatory amino acids in the neostriatum. *Adv. Pharmacol.* 42 : 724-729, 1998.

Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein meseanement with folin phenol reagent. *J. Biol. Chem*. 193 : 265, 1965.

Markarchenko AK, Kirichiuskii BR, Roitruls BA, Baraboi VA.*Bull. Expl. Bio. Med.* 66 :340, 1951, 1968.

Moron, MS Depierse JW, Manrerirk B. Levels of GSH, GR, and GST activities in rat long and liver. *Bio. Chem. Biophy. Acta.* 582: 67, 1979.

Moriguchi T, Saito H, Nishiyama N. Anti-aging effect of aged garlic extract in the inbred brain atrophy mouse model. *Clin. Exp. Pharmacol. Physiol.* 24 : 235-242, 1997.

Nlshiyama N, Moriguchi T, Saito H. Beneficial effects of aged garlic extract on learning and memory impairment in the senescence-accelerated mouse. *Exp. Gerontol.* 32 :149-160, 1997.

Nagahara AH, Gill TM, Nicolle M, Gallagher M. Alteration in opiate receptor binding in the hippocampus of aged long-Evans rats. *Brain Res.* 707 : 22-30, 1996.

Oyama BD, Mazza G. Flavonoids and antioxidants in buckwheat. *J. Agric.Food Chem.* 7 :1746-1750, 1994.

Ord MG, Stocken LA. The effect of X-rays on nucleic acid metabolism in rat *in vivo*. *J. Biochem.* 63 3-8, 1956.

Oyama YA, Hayashi H, Ueha T. Ca^{+2}–induced increase in oxidative metabolism of dissociated mammalian brain neurons effect of extract of Ginkgo biloba leaves. *Jpn. J. Pharmacol.* 61 :367-370, 1993.

Olanow CW. An introduction to the free radical hypothesis in Parkinson,s disease. *Ann. Neurol.* 32 :52-59, 1992.

Perrig WJ, Perrig P, Stahelin HB. The relation between antioxidants and memory performance in the old and very old. *J. Am. Geriatr. Soc.* 45 (6) : 718-724, 1997.

Pratt DE, MT In Hung, Hoc.- H, Lee CY (Eds). Phenolic compounds in food and their effects on Health 11. *Am. Chem. Soc. Washington*, 54, 1992.

Rai SS, Shovlin C, Wesnes KA. A double –blind placebo controlled study of *Ginkgo biloba* extract ("tanakn") in elderly out patients with mild to moderate memory impairment. *Curr. Med. Res. Opin.* 12 : 350-355, 1991.

Sorata Y, Takahama U, Kimura M. Protective effect of quercetin and rutin on photosensitized lysis of human erythrocyte in the presence of hematoporphyrin. *Biochem. Biophys. Acta.* 799 :313-317, 1984.

Sano M, Ernesto C, Thomas RG, Klauber MR, Schafer K, Graundman M, Woodbury P, Growdon J, Cotman CW, Pteiffer E, Schneider LS, Thal LJ. A controlled trial of selegiline, alpha-tocopherol or both as treatment for Alzheimer disease. The Alzheimers disease cooperative study, New England. *J. Med*. 336 : 1216-1222, 1997.

Shukitt-Hale B, Erat SA, Joseph JA. Spatial learning and memory deficits induced by dopamine administration with decreased glutathione. Free Radic. *Bio. Med.* 241: 149-1158, 1998a.

Shukitt–Hale B, Mouzaks G, Joseph JA. Psychomotor and spatial memory performance in aging male Fischer 344 rats. *Exp. Gerontol.* 33: 615-624, 1998b.

Sen CK. *Mol. Cell. Biochem*. 196, 1999.

Torel J, Clillard J, Clillard P. Antioxidant activity of flavonids and reactivity with peroxy radica. *Phytochemistry*. 25 :1383-1386, 1986.

Uchiyama T, Fausto N, Vanlancker JL. Molecular mechanism of liver regeneration. The effect of X-radiation on the incorporation of 14C-ortic acid in to rapidly labelled nuclear RNA. *J. Bio. Chem.,* 241: 991-996, 1996.

Verma RK, Jain M, Saini PP, Bhatia AL. Modification of radiation induced biochemical changes in Swiss Albino mice brain by *Amaranthus paniculatus*. *Proceeding in National conference Scope and Opportunities in research and business of medicinal and Aromatic plants,* 17-18 May, in Lucknow, 41, 2002.

Van Stuijvenberg ME, Kavalsvig JDM., FaberKruger M, Kenoyer DG, Benade AJ. Effect of iron-iodine and beta-carotene fortified biscuits. The micro-nutrients status of primary school children: a randomized controlled trial. *Am. J. Cli. Nutr.* 69 (6) :1294, 1999.

Yufu F, Egashira T, Ymanaka Y. Age-related changes of chdergic markers in the rat brain. *Jpn. J. Pharmacol.* 66 : 247-255, 1994.

Yen Grow-chin, Chig W, Pin-der D. Extraction and identification of compounds from the levels of *Mulbery*. *J. Agri. Food Chem.* 44:1687-1690, 1996.

Zurovsky Y, Eligal Z, Grossman S. Unilateral renal ischemia reperfusion in the rat : effect of blood volume trapped in Kidney, sucrose infusion and antioxidant treatment Exp. *Toxi. Pathol.* 47 471-478, 1995.

Zurovsky Y, Eligal Z, Grossman S, Bergman M, Gafter. Glycerol-induced augmentation of sensitivity to endotoxi rats. *Toxico.* 32 : 17-26, 1994.

Zurovsky Y, Gispann I. Antioxidant attenuate endoto-induced acute renal failure in the rats. *Am. J. Kid. Dis.* 25: 57, 1995.

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Memory Status in the Elderly and its Correlates : An Intervention Study

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ABSTRACT

Memory is the crux around which all the life gets organized. It is expected that with the increase of age there is a fading in memory. This place of research assesses the memory status in the elderly (memory performance) and study the contribution of a set of psycholsocial factors. They were assessed by using standard tests. The sample consisted of 300 community dwelling older men and women who were drawn by a Multistage random sampling technique. Results showed that self rated memory, self esteem and locus of control were found to be significantly correlated with Memory performance. Implications of an intervention are discussed.

Keywords : Elderly, Memory performance, Selfesteem, Locus of control, Intervention.

Memory is the power or process of reproducing or recalling what has been learned and retained especially through associate mechanisms (Webster's dictionary, 1967). Alternately, it refers to the store of material learned and retained as evidenced by recall and recognition. Regardless of whether the cause is physiological, bio-chemical and motivational or due to other non-cognitive factors, there are differences in memory functioning between the young and the old (Gilbert, 1941; Mcmulty and Caird, 1966; Thomas *et al.*, 1978; Woodworth and Schlosberg, 1954). Retrieval deficits in old age may be due to failure in registration, organization and retention (Howard, 1966; Talland, 1965; Mcmulty and Caird, 1966). Slowness

in central processing mechanism is a characteristic in old age. Lack of ability to retrieve from memory storage is another reason for poor memory in old age (Broadbent, 1958; Inglis, 1965). Age changes also appear when the information is disorganized or scrambled (Cralk and Rabinowitz, 1985; Darlene *et al.,* 1991; Howard, 1966).

The Memory Facets Examined

Working memory : It is the active processes and structures involved in holding information in mind and simultaneously using that information, sometimes in conjunction with incoming information, to solve a problem, make a decision, or learn new information (Baddley, 1986; Zacks *et al.,* 2000). Working memory is with a limited capacity, workspace that can be divided between storage and control processing (Cavanugh, 1997; Salthouse, 1991). Due to the retrieval problems older adults' experience changes in working memory. Studies indicate that older adults take more space by keeping irrelevant information in working memory which prevents them to use it for relevant information than younger adults (Hasher and Zacks, 1988). Because working memory deals with information being processed right at this moment, it also acts as a kind of mental scratchpad. Research on working memory is relatively new a great deal more research needs to be carried out.

The cross section and longitudinal studies led to the conclusion that the 65.75 decade was a watershed for decremental changes in immediate memory (e.g., Salthouse and Kausler, 1988) and selected normal loss and slower reproduction times were considered as possible causes (Glamber et al., 1995; Marko, 1995). Andiel adn Lilli (1995) reviewed the traditional concepts of STM and changes in wokring memory in older adults suggest that they may experience difficulties with mediation management. It was concluded that memory span reflects a general store of ability rather than a specific ability to retian information about the order of a sequence of events (Baltes and Smith, 1997; Baltes and Lindenberger, 1997; Park *et al.,* 1999).

Long term memory : It is the ability to remember extensive amounts of information from a few seconds to a few hours to decades (Cavanaugh and Blanchard-Fields, 2002). It is generally assumed that it is the store house of one's past experiences, holding the content of memory related to one's child hood, our knowledge

about the world, about how to do things and even information on the way our thought process works (Allgretti and Puglisi, 1982). Semantic memory has been viewed as the repository of facts, ideas and concepts that are stored without reference to the temporal and spatial context present at the time of storage (Tulving, 1972). Several conclusions were drawn from the results of hundreds of studies on secondary conclusions were drawn from the reslts of hundreds of studies on secondary memory showed over all adults perform worse than younger adults on tests of secondary memory (*e.g.*, Brent *et al.,* 1999; Mathew, 1998; Poon, 1985; Rybash, 1996; Verhaeghan *et al.,* 1993).

Verbal memory : It refersto recall of material presented in the form of verbal stimuli i.e., words, sentences and stories etc. The originator was Hermann Ebbinghaus (1885) and perhaps the first formal study of adult age differences in serial learning with verbal elements was that of Bromley (1958). The total number of errors at eachserial position is imply greater for the elderly subjects (Eisdorfer *et al.,* 1963).However, the use of mediation during practice on paired assocaites may lead to differences between young and old (Hulicka and Grossman, 1967) but in recent years the interest has reappeared toward the use of paired associates in memory interventions (Treat *et al.,* 1978). It was reported that use of imaginal mediators are more effective than verbal mediators for both younger and older adults (e.g., Kausler and Lair, 1965; 1996; Paivio, 1971; Slegler *et al.,* 1982) and older subjects are somewhat less proficient incidental learners than younger subjects (Crook *et al.,* 1993). Recent research on cognitive aging indicates the importance of experience and practice in skill maintenance for a particular activity (Salthouse, 1987) and perhaps not surprisingly such expertise is relatively domain specific and does not extend to other tasks (Hoyer, 1985). Deficits in remembering self-performed action were similar to deficits in remembering verbal material (Crossley and Hiscock, 1992; Verhaeghen *et al.,* 1993) which are prominent for highly related words as for low related words (e.g., Park, 1997; Poon, 1985; Salthouse, 1994).

Pictorial memory : It referes to recall of material presented in the form of visual stimuli i.e., shapes, faces, abstrct drawings, line drawings etc., Pictures of day-to-day objects or complex real world

scenes are a potential source of stimull for memory research (Bartlett and Leslie, 1986; Crook and Larrabee, 1992). Certain features of a picture are specific to some cultures. It is a fact that neural traces to visual stimuli persist longer for elderly adlts than for young adults (Erikson and Collins, 1967). Several studies have revealed the startling ability of young adults to recognize with great accuracy of pictures of scenes even though hundreds and even thousand pictures were presented for a single study trial (Shepard, 1967). This effect is consistent with an important theory that postulates the existence of separate but interacting, picture memory and word memory systems (Paivio, 1969; 1971). Rissenberg and Glanzer (1986) discovered that their elderly subjects displayed the picture superiority effects only when they have to name overtly the objects in the pictures as they were presented. On the other hand, younger subjects displayed the picture superiority effects whether or not they were required to name the objects (Bartlett *et al.*, 1983; Park *et al.,* 1983; 1984).The advantage that pictures have over words in recognition is known as the picture superiority effect (Rissenberg and Glanzer, 1986). Research found only small age difference in picture recognition (Denney et al., 1991) and some studies on pictorial memory showed age decrement (e.g., Crook and Larrabee, 1992; Perimutter *et al.*, 1980; Rybarczyk *et al.*, 1987; Trahan *et al.,* 1986) while others did not (e.g., Bahrick, 1984; Park *et al.,* 1990).

Remote memory : It refers to the storage where information that needs to be kept for a very long time (Cavanaugh, 1997; McKinnon and Squire, 1989; Poon, 1985). It includes the major forms like Episodic mwemory and Autobiographical memory. There are very few studies in which remote memories have been examined longitudinally and in those studies, the investigator and subjects were the person (Botwinick, 1967). Poon *et al.* (1979) contradicts the once popular Ribot's Hypothesis (1882). According to Ribot, thememory inputs are likely to displace recent than distant memories but Poon *et al.* (1979) concluded that the elderly exhibited no impairment of the ability to remember recent colloquial events and the elderly's surprisingly accurate recall of remote events was not a product of selective and frequent rehearsal. The review of age differences or changes in episodic memory proficiency focused on research investigated by information processing models and analyses of the human memory system (e.g., Craik and Jennings, 1992; Hess and

Follet, 1994; Hultsch and Dixon, 1989; Kausler, 1989; Light, 1992; Perimutter *et al.,* 1987; Poon, 1985; 1994).

Autobiographical memory is one of the important forms of Remote memory, which involves remembering information and events from our life. These autobiographical memories refer to personally experienced events that are unique to an individual (Bartlett, 1932; Galton, 1911; Field, 1984). For an approach to autobiographical, episodic and semantic memory, socio-cultural and developmental determinants of memorability adn internal mechanisms of the cognitive system are important (Nyberg *et al.,* 1995; Troyer *et al.,* 1994).

Psycho-social correlates of memory

Many studies reported that physical and mental health may have a significant effect on learning and memory. It is evident that elderly exhibit higher levels of anxiety than young adults in testing and exhibit poor performance in memory tasks (Kausler, 1991). If anxiety levels increase, it leads to worry and they focus more on their state (condition) instead of on the task, that is to say the anxiety levels pull their attention and affect the performance (Perlmultter *et al.,* 1987). Also, studies on non-clinical depressed elderly subjects indicate that the subjects show decreased interest, incapability of organising the material, unable to use effective strategies, declined attention and RT and decreased ability to recall and learn (e.g., Cohen *et al.,* 1982; Weingartner *et al.,* 1982).

Studies also reported the important relationship between health and cognitive functioning in different age groups (Perlmutter and Nyquist, 1990). Poor self reported health may contribute to feelings of disability, helplessness and to a negative image of one self. This negative distressing perception of oneself may inturn contribute to negative self feelings and low esteem - factors which might affect memory performance negatively. Also physical exercise improves memory in middle aged and older adults and that aerobic exercise improves performance on digit - span test (Perlmutter *et al.*, 1987), attention span of the elderly and inturn cognitive tasks (Ohisson, 1976) and good performance in non-verbal material (Elsayed, *et al.,* 1980). Evidence is also available that subjects with regular vigorous exercise have efficient short-term memories than subjects with sedentary habits (Clarkson-Smith and Hartly, 1989).

An overall observation with regard to ageing changes in any domain would be to expect a decline in functions, which in this case would be memory functions. If the dimensions and facets of memory were to be uniform, generalisations would be easy. But in human memory we have multiple dimensions and a multitude of factes with varied and complex underlying processes and exhibit significant individual differences (Jerker, 1986). It would perhaps be a futile exercise to comprehend at one go these age changes. To some extent a semblance of an effort has been put up to very briefly sum up the studies in the respective domains of memory. Researches on the relationship of psychosocial variables with different facts of memory have not been extensive but sparse.

Memory researches in India

Indian researches carried out on memory are very few (Ramamurti and Jamuna, 1984, 1993, 1995). For e g.., Pershad and Wig (1977) developed PGI Memory Scale for Memory Testing in the elderly subjects. Prior to this isaacs and Aktar (1972) developed "The Set Test". This test is a rapid one to measure the mental functions of the normal elderly and one that is not dependent on the subjects cultural and educational background. It can be used in clinical and epidemiological setting (Anuradha et al., 1991) and for normal elderly (Dubey & Verma, 191) while assessing memory in the aged.

In specific, the memory tests to assess short term and long term memory, verbal memory, pictorial and remote memory (Wechsler, 1945) were developed to assess how memory functioning is a psychological correlate to the quality of life in the elderly (Jamuna *et al.*, 1999). With all the above the tests like free word assocaition test. Letter span test, Episodic memory test and Autobiographical tests were also used to assess different facets of memory (Jamuna *et al.*, 1999).

In summary, some studies reported age decrements in working memory while others did not. Some studies in semantic memory reported age decrements while others did not. Similarly some studies on verbal memory and studies on pictorial memory and remote

memory also showed some age decrement. Also the studies do not indicate any clear-cut trend. It is rather difficult to sum up available research in an area such as memory and ageing, the field being so vast and varied. Waht has been done in the aforementioned pages is to report representative studies of more recent times that are directly relevant to the facets of memory and related variables in older years. Nevertheless, the studies have suggested the relevance of these factors and indicated a need for further investigation.

From the agove it is clear that there is a paucity of studies on memory in the elderly in India. Keeping this in view the study was planned with the following objectives :

1. To assess certain facets of memory viz., working memory, semantic memory, verbal memory, pictorial memory and remote memory among 300 Indian elderly men and women.
2. To examine the association of different facets of memory with psycho-social variables viz., self rated memory, self reported physical and psychological health, self perception of social supports, life stress, self esteem and I.E. locus of control among elderly men and women.
3. To test the efficacy of intervention in improving memory performance in a select sample fo elderly.

Sample

I. Sample for the main study : The sample consists of 300 community dwelling-elderly male and female from the rural and urban areas of Rayalaseema region. The socio-demographic details of the sample were shown in Table-1. The subjects were drawn from Chittoor, Guddapah district using a multi-stage random sampling technique. The subjects included in the study were cognitively intact and without marked disabilities and those who could read and write Telugu and familiar with digits were included in the sample.

II. Intervention sample : The subjects for the intervention phase consisted of 60 elderly men and women (30 in Experimental group and 30 in Control group). They were selected from the main

sample and their ability levels, education, age and gender were fairly matched.

Table -1 : Socio-Demographic details of the sample

Sl. No.	Sub-Groups	N	%
1.	**Age wise**		
	60-69	100	33.4
	70-79	100	33.3
	80-89	100	33.3
2.	**Gender**		
	Male	150	50.0
	Female	150	50.0
3.	**Locality**		
	Rural	150	50.0
	Urban	150	50.0
4.	**Educational status**		
	Just literate	158	52.7
	Primary Edn.	82	27.3
	High school Edn.	45	15.0
	College Education	15	5.0
5.	**Economic status**		
	Low income	70	23.3
	Low middle	90	30.0
	Middle	131	43.7
	Upper Middle	9	3.0
6.	**Marital status**		
	Without spouse	154	51.4
	With spouse	146	48.6

Tools

(i) **Tolls for main study :** The five facets of memory were assessed by using sub-tests of Wechsler Memory Scale (and other standardized tests). The Psychosocial variables were assessed through standardised tools. Self rated memory by using a rating scale; self reported physical and psychological health by using the adapted versions of Cornell Medical indices (A&B) (Ramamurti and Jamuna 19920; Perception of social supports through Social support inventory (Jamuna and Ramamurti, 1991); self esteem through an adapted version of Rosenberg (1965) Self-esteem through an adapted

version of Rosenberg (1965) Self-esteem scale and I-E locus of control by employing Levenson's I-E Scale (Jamuna et al., 1999). All the tools were standardised as part of major research projects at the Centre for Research on Aging (Jamuna *et al.,* 1999; Jamuna and Ramamurti, 2000).

(ii) **Intervention module :** To realise one of the objectives of the present study, a training module was prepared by including some sub-facets like memory for digit span (forward and backward) and paired associate test. These tests were selected from Form II of Wechsler Memory scale (19480.

Method

The study was planned in three stages i.e., Screening stage, Testing stage and intervention stage. All the subjects were personally contacted and prior consent was taken to administer the tests. Those who are interested to participate only include in the sample.

In the Screening stage, subjects were assessed for their functional capability in self help skills in their daily life and their interest towards investigation was observed. If these were poor they were dropped. The subjects who had diffficulty in communication and comprehension or were not willing to participate in the study were identified and excluded frm the study sample. In the **Testing stage**, testign was commendced in the first session of interview itself if subjects were free and willing to participate. The whole investigation was carried in one session usually lasted for an hour to one and half hours. In the **Intervention stage**, intensive training was extended only to the subjects in the Experimental group and no internvention for the Control group subjects. The intervention session was extended over 8 sessions and each session lasted for one hour. The intervention consisted of briefing and training in the use of method of loci and method of links and use of external aids to enhance remembering. The Pre and Post internvention performance of these two groups were compared to evaluate the efficacy of intervention.

Results and Discussion

Memory performance generally affected by two interrelated factors namely individual's socio-demographic status and the psycho-social status. Plenty of studies in western literature clearly

brought out the role of age, education and where the person living influences one's memory performance. The results were presented in two sections. Section-I deals with Facets of memory and its correlates and Section. II deals with intervention results in improving memory performance.

Section-I : Facets of memory and its Psycho-social correlates

To show age-wise decrement in each facet of memory the Mean trends of the sample were presented in Table-2.

Table-2 : Age-wise Means in different Facets of Memory

S.No.	Facet of Memory	60-69	70-79	80-89
1.	***Working memory***			
	Logical Information	14.43	13.09	9.92
	Forward Digit span	4.78	3.89	3.12
	Backward Digit span	3.70	3.43	3.16
	Letter span	3.51	3.41	2.84
2.	***Semantle memory***			
	Personal & Current Information	4.05	3.84	3.05
	Orientation	3.93	3.56	3.04
	Mental Control	5.59	5.40	3.87
	Free word association	2.32	2.03	1.97
3.	***Verbal memory***	11.85	11.96	8.08
4.	***Pictorial memory***	3.42	3.24	2.08
5.	***Remote memory***			
	Autobiographical	1.89	1.26	1.10
	Episodic	2.94	2.58	1.79

From the above, it is clear that with the increase of age there is a decline in memory performance in all most all the facets except in verbal memory and pictorial memory. Similar trends were observed in many western studies (e.g., Andiel and Lilli (1995); Baltes and Lindenberger, 1997; Giambra *et al.,* 1995; Marko, 1995; Park *et al.,* 1999; Poon, 1985; Salthouse, 1994).

Thus, in this article only the role of different psychosocial aspects influencing the individual's performance were discussed at length here below. The correaltions between the facets of memory and other psychological variables in the study have been doen with a

view to elucidate the nature and extent of the relationship betwen these variables and to identify the signfiicant correlates of different facets of memory.

The correlations obtained between the facets of memory on one hand and the psychological variables on the other hand are presented as follows :

Working memory and its correlates

An inspection of Table-3 reveals that the sub facets of working memory i.e., memory for logical information correlates positively with self rated memory (r=0.74), self-esteem (r=0.54) and locus of control (r=0.76) and self-reported physical distress (r=0.16). At the same time, signfiicant negative correlations are seen with self-reported psychological distress (r=0.22) and life stress (r=-0.17). There is no significant correlation between self-perception of social supports and memory for logical information (r=-0.05).

The correlations reveal that high scores in the sub facet of working memory viz., logical information tend to be better only when there is a positive self rated memory, favourable self perception of physical health and psychological helath, high self esteem and internality. Also this tends to be low when experience of stressful life events were high. Another interestng finding is that memory for logical information is seen more in the elderly who rate their memory as good by themselves, who have high esteem and externality orientation.

Table-3 : Correlations between working memory and other Psychological factors

Sl.No.	Psychological Factors	Working memory			
		Logical Information	Digit Forward	Digit Backward	Letter Span
1.	Self rated memory	0.74*	0.68*	0.67*	0.62*
2.	Self rated physical health	0.16*	-0.18*	-0.19*	-0.22**
3.	Self rated psychoogical health	-0.22**	-0.19*	-0.28**	-0.29**
4.	Social Supports	-0.05	-0.04	-0.03	-0.02

5.	Life events	-0.17*	-0.13*	-0.14	0.00
6.	Self esteem	0.54**	0.67**	0.66**	0.59**
7.	Locus of Control	0.76**	0.49**	0.47**	0.42**

** P < 0.01; *P<0.05)

Nextly, the sub facet of working memory i.e., memory for digit span-forward and its association with psychological variables were examined. This sub facet correlates positively with self rated memory (r=0.68), self-esteem (r=0.67) and locus of control (r=0.49) and negatively with self reported physical distress (r=-0.18), self reported psychological distress (r=-0.19) and life stress (-0.13) and no insignficant correlation with self perception of social supports (-0.04).

It is clear from the abov ecorrelations that self rated memory and self eseem are predictive of better performance in memory for forward digit. An explanation which may be plausible in this context is that elderly who have positive evaluation of one's own memory status and high esteem of oneself have atendency to score better on this memory for forward digit span. The negative correlations obtained with self reported physical health, psychological distress and stressful life events indicate that the presence of distress either physical or psychological and experience of stressful life events influence the performance on forward digit span. The same trends were observed for digit backward also.

The data on memory for letter span indicate that it is correlated significantly with self rated memory (r=0.62), self esteem (r=0.59) and internal locus of control (r=0.42) and negatively correlated with self reported physical health (r=-0.22) and self reported psychological health ((r=-0.29). In short, the picture that emerges is that elderly with favourable perception of one's own memory, high esteem of oneself and internaility orientation tend to have better memory for logial ideas, digits and letter span.

Semantic memory and its correlates

As can be seen from table-4 that some psychological variables viz., self-rated memory (r=0.65), self esteem (r=0.61), perception of social supports (r=0.15), Internal locus of control (r=0.48) were

positively correlated but the other variables like self reported physical distress (-0.25) and self reported psychological health (-0.31) were significant and negatively correlated.

Table - 4 : Correlations between Semantic memory and other Psychological factors

Sl. No.	Factors	Psychological	Semantic Memory		
		Personal & Current Information	Orientation	Mental Control	Free word Association
1.	Self rated memory	0.65**	0.60**	0.60**	0.42*
2.	Self rated physical health	-0.25**	-0.20*	0.18*	-0.18*
3.	Self rated psychological health	-0.31**	0.25**	-0.19*	-0.41
4.	Social Supports	0.15**	0.05	0.17*	-0.03
5.	Life events	0.09	0.03	0.02	0.07
6.	Self esteem	0.61**	0.59**	0.67**	0.42**
7.	Locus of Control	0.48**	0.42**	0.49**	0.26**

**P<0.01; *P<0.05

The variable life stress correlated very low with this sub facet of memory i.e., personal and current information. Similar associations can be observed with regard to other events like memory for orientation tasks, mental control tasks and free word association. But variables like perception of social supports and life stress correlated very low with memory for orientation and free word association.

This may be expected owing to the fact that the performance on sub facets of semantic memory is possible only wen an elderly has fellings of self-efficacy, self worth and positive perception of family and social supports. This suggests that high subjective feelings of somatic distress, psychological distres along with intensity of stress experienced in certain life events significant effect on the performance in the facet in the facet of memory.

Verbal, Pictorial and Remote memory and their correlates

The results in one of the facets of memory viz., verbal memory (vide table-5) indicate that it is significantly correlated with self rated memory (r=0.70), self esteem (r=0.69) and internal locus of control (r=0.48), negatively correlated with self reported physical health (r=-0.17) and psychological distress (r = -0.25). There is low but positive signfiicant correlation between this facet adn life events (r = 10). Similar to the above findings in this facet also variables liek

subjective rating of memory, self-esteem and internal locus of control were found to be the significant correlates of memory.

Considering the results in the fact of pictorial memor. It is correlated significantly with self rated memory (r = 0.57), self - esteem (r = 0.59), internal locus of control (r = 0.40), negatively correlated with self reported physical distress (r = -0.26) and self reported psychological health (r = -0.19) but insignificant correlations with perception of social supports (r = 0.03) and life events (r = -0.03).

Table-5 : Correlations between verbal, pictorial and remote memory and other psychological factors

Sl.No.	Psychological factors Factors	Verbal Memory	Pictorial Memory	Remote Memory
1.	Self rated memory	0.70**	0.57**	0.48**
2.	Self rated physical health	-0.17*	-0.26**	-0.23**
3.	Self rated psychoogical health	-0.25**	-0.19*	-0.25**
4.	Social Supports	0.02	0.03	0.05
5.	Life events	0.10*	-0.03	0.05
6.	Self esteem	0.69**	0.59**	0.44**
7.	Locus of Control	0.48**	0.40**	0.38**

** P < 0.01; *P<0.05

Results with regard to remote memory (vide table-4) indicate that there exists significant positive correlations with self rated memory (r=0.48), self-esteem (r=0.44), internal locus of control (r=0.38), negatively correlated with self reported physical distress (r=0.23) and self reported psychological health (r=-0.25) but insignificant correlations exist with perception of social supports and life events.

The picture one gets from the above is that in almost all the facets of memory, self rated memory (subjective) was the significant correlate followed by self esteem and locus of control. Teh self-reported physical health and psychological health were the other signfiicant correlates that were negatively correlated to the performance of memory in various facets. It is possible that the relationship between the feelings of subject worth or self efficacy is the significant predictor of well being of elderly. As such this was

found to be an important factor in memory. Similarly feeling of high regard for oneself will enhance one's morale and inturn influence one's physical and psychological functioning. It may be rational to expect that stres as experienced in various life events and unfavourable perceptions of social supports may have an effect on the cognitive functioning of an individual. Especially when a person grows old the meaningful supports are critical to make adaptation to the stressful life events. The quality and quantity of social networks and the supports through them will go a long way in the maintenance of psychological well-being (Ramamurti and Jamuna, 1995). There is a very little support for the relationship between memory performance and social supports and stressful life events. The significant positive correlations between internal locus of control and better memory performance suggest that the perception of internal locus is associated with good memory. Many studies found I-E personality characteristic is related to several arrays of intellectual behaviours and developmental antecedents (Dupont, 1980; Lau et al., 1981; Witkin and Goodenough, 1977). It is worth to recall the message of Plaget on cognition-affection aspects. As Piaget (1962) states that without affect there would be no interest, no needs and no motivation. First we must agree that at no level, at no stage, even in the adult, it is hard to find a behaviour or a state which is purely cognitive without affect nor purely affective state without a cognitive element involved. It is during the later years of adolescence and maturity that Piaget opted for a condition of cognition/personality parallelism (Piaget, 1962).

Section.II : Interventioln results in improving memory performance

Since this research work was carried out by a single individual in a specific time, the intervention necessarily had to be on a small scale and experimental in nature. The purpose was merely to demonstrate that such an intervention is feasible to improve the meory competence in the community-dwelling elderly in India. The evaluation of efficacy of intervention was tested by comparing the pre and post test performance in each sub facet of memory and the results are reported in Table 6.

Table 6 : Pre and Post test scores in Different Facets of Memory

Memory facet	Experimental Group			Control Group		
	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	t	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	t
Digit span forward	3.9 (1.7)	5.3 (1.03)	10.01**	3.70 (1.3)	3.31 (1.08)	1.25@
Digit span backward	3.46 (1.6)	5.2 (1.49)	7.10**	3.51 (1.61)	3.56 (1.62)	1.00@
Digit span Paired Associates	9.60 (3.7)	14.83 (3.29)	5.8**	9.4 (3.86)	10.03 (3.51)	1.12@

$P < 0.01$; @ = Not significant

Considering the results significant differences were found in the performance of all the sub facets of Experimental group, highlighting the efficacy of interventions. There were no pre and post test differences in control group. Though there is a light improvement in the perform ance of memory for digit backward and paired associates without any interventions, but differences were not significant. The quantum of improvement after interventions was significantly high in experimental group. These results demonstrate the efficacy of interventions in improving memory in old age. Thus, the intervention results accept the fact that there is a significant difference in the memory performance i.e., in memory for digit span and verbal memory, between pre intervention and post intervention scores among the elderly. The interventions in large scale need to be planned to improve the quality of life of the elderly.

Implications of the study

Atleast two important implications are seen, namely,

1. The study had brought out clearly the role of certain psycho-social variables such as self rated memory, self-esteem, self reported physical and psychological health, life stress, internal

locus of control, perception of social supports on performance in different facets of memory.

2. In view of the favourable effect of interventional training, the application of large scale interventions to improve the memory function would go a long way in improving their memory and generally reducing their dependency. It has both practical as well as polciy implications.

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References

Allegretti, C.L., & Puglisi, T., J. Recognition of letters in words and non-words. *Journal of General Psychology,* 107 (1), 139-148, 1982.

Andiel, C., & Lilli, L. Working memory and older adults : Implications for occupational therapy. *American Journal of Occupational Therapy, 49* (7), 681-686, 1995.

Anuradha, J., Amita, V., and Verma, S.K. Some experience with a rapid test of mental functions in the elderly. In I.J. Prakash (Ed.,) *Quality Aging* (179-185). Varanasi : Association of Gerontology (India), BHU, 1991.

Baddeley, A. *Working Memory.* Oxford, England : Clarendon Press, 1986.

Bahrick, H.P. Measurement of memory by prompted recall. *Psychological Review, 77,* 215-222, 1969.

Baltes, P.B., & Lindenberger, U. Emergence of a powerful connection between sensory and cognitive functions across the adult life span : A new window to the study of cognitive aging. *Psychology and Aging, 12,* 12-21, 1997.

Baltes, P.B., & Smith, J. A systematic-wholistic view of psychological functioning in very old age : Introduction to a collection of articles from the Berlin Aging Study. *Psychology and Aging, 12,* I395-409, 1997.

Barlett, F.C. *Remembering : A study in experimental and social psychology.* Cambridge, England : Cambridge University press, 1932.

Bartlett, J.C. & Leslie, J.E. Aging and memory for faces vs. single views of faces. *Memory and Cognition, 14* (5), 371-381, 1986.

Bartlett, J.C., Jill, R.E., Gernsbacher, M., & Gorman, W. Aged related differences in memory for lateral orientation of pictures. *Journal of gerontology, 38* (4), 436-446, 1983.

Botwinick, J. *Cognitive processes in maturity and old age.* New York : Springer, 1967.

Broadbent, D.E. *Perception and Communication.* London : Pergamon Press, 1958.

Brent et al.. Longitudinal changes in qualitative indicators of word and story recall in young-old and old-old adults. *Journal of Gerontology, 54* (2), 107-115, 1999.

Bromley, D.B. Some effects of age on short-term learning and remembering. *Journal of Gerontology, 13,* 398-406, 1958.

Cavanaugh, J.C. *Adult Development and Aging.* 3rd Edn. New York : Thomson Pub. Inc, 1997.

Cavanaugh, J.C., and Blanchard-Fields, F. *Adult Development and Aging.* 3rd Edn., USA : Wadsworth, 2002.

Clarkson-Smith, L., & Hartley, A.A. Relationships between physical exercise and cognitive ability in order adult. *Psychology and Aging, 4,* 183-189, 1989.

Cohen, R.M., Weingartner, H., Smallberg, S.A., Pickar, D., & Murphy, D.L. Effort and cognition in depression. *Archives of General Psychiatry, 39,* 593-597, 1982.

Craik, F.I.M. & Rabinowitz, J.C. The effects of presentation rate and encoding task on age-related memory deficits. *Journal of Gerontology, 40* (3), 309-315, 1985.

Crook, T.H., & Larrabee, G.J. Changes in facial recognition memory across the adult lifespan. *Journal of Gerontology, 47,* 138-141, 1992.

Crook, T.H., & Larrabee, G.J. Changes in facial recognition memory across the adult life span. *Journal of Gerontology, 47,* 138-141, 1992.

Crook, T.H., Larrabee, G.J., & Youngjohn, J.R. Age and incidental recall for a simulated everyday memory task. *Journal of Gerontology, 48,* 45-47, 1993.

Crossley, M., & Hiscock, M. Age-related differences in concurrent task performance of normal adults : Evidence for a decline in processing resources. *Psychology and Aging, 7,* 499-506, 1992.

Darlene, H., Fry, V., & Caitlinn, B. Aging and memory for new associations : Direct vs. Indirect measures. *Journal of Experimental Psychology : Learning, Memory and Cognition, 17* (4) : 779-792, 1991.

Denney, N.W., Miller, B.V., Dew, J.R., & Levav, A.L. An adult developmental study of contextual memory. *The Journal of Gerontology, 46,* 44-50, 1991.

Dubey, B.L., and Verma, S.K. Mental efficiency as a function of time in the elderly rural subjects. *Journal of Personality and Clinical studies 7* (1), 96-98, 1991.

Dupont, F.L. Locus of control among the aged. Diss. Abstr. Int., 41, 1133-B, 1980.

Ebbinghaus, H. Uber das Gedachtnis Leipzig : Duncker. Translated by Ruger, H.A., and Bussenius, C.E. (1913) Memory, New York: Teacher's College, Columbia University, 1885.

Eisdorfer, C., Axelrod, S., & Wilkiet, F.L. Stimulus exposure time as a factor iln a serial learning in an aged sample. *Journal of Abnormal and Social Psychology, 67,* 594-600, 1963.

Elsayed, M., Ismail, A.H., & Young, R.S. Intellectual differences of adult men related to age and physical fitness before and after

an exercise program. *Journal of Gerontology, 35,* 383-387, 1980.

Erikson, C.W., & Collins, J.F. Some temporal characteristics of visual pattern perception. *Journal of Experimental Psychology, 74,* 476-484, 1967.

Galton, F. Inquiries into human faculty and its development. (2nd Ed.). New York : Dutton, 1911.

Glambra, L.M., Aremberg, D., Zonderman, A.B., Kawas, C., *et al.*, (1995). Adult life span changes in immediate visual memory and verbal intelligence. *Psychology and Aging,* **10** (1), 123-139.

Gilbert, J.G. Memory loss in senescence. *Journal of Abnormal and Social Psychology,* **60**, 73-86, 1941.

Hasher, L., and Zacks, R.T. Working memory, comprehension, and aging : a review and a new view. In G.H. Bower (ed.). *The Psychology of learning and motivation - Advances in research and theory.* San Diego : Academic Press, 1988.

Howard, F. Memory organization in the aged people. *Journal of Genetic Psychology,* **109** (1), 3-18, 1966.

Hoyer, W.J. (1985). Aging and the development of expert cognition. In T.M. Schlecter and M.P. Toglia (Eds.), New Direction in Cognitive Science (69-87). Norwood, NJ : Ablex.

Hulicka, I.M., and Grossman, J.L. (19667). Age-group comparisons for the use of mediators in paired associate learning. *Journal of Gerontology,* **22**, 46-51.

Inglls, J. (1965). Immediate memory, age and brain function. In A.T. Welford and J.E. Birren (Eds.), *Behaviour Aging and the Nervous System* (461-475) Springfield, III : Charles C. Thomas.

Jamuna, D. and Ramamurti, P.V. (1991). Social supports inventory for the elderly. *Journal of Psychometry*, **35** (2), 133-136.

Jamuna, D. and Ramamurti, P.V. (2000).. *Psychologicla correlates of long lived individuals.* Project Report submitted to University Grants Commission, New Delhi.

Jamuna, D., Sujatharamamurti, Reddy, L.K. (1999). *Correlates of Quality of Life among Indian Elderly men and women*. Project Report submitted Indian Council of Medical Research (ICMR), New Delhi

Jerker, R. (1986). Cognitive Psychology in Scandinavia : Attention, Memory, Learning and Memory dysfunctions. *Scandinavian Journal of Psychology,* **27**(2), 95-149.

Kausler, D.H. (1991). *Experimental Psychology, Cognition, and Human Aging.* (2nd ed.) New York : Sringer - Verlag.

Kusler, D.H. and Lair, C.V. (1965). R.S. ("backward") paired-associate learning in elderly subjects. *Journal of Gerontology,* **20**, 29-31.

Kausler, D.H. and Lair, C.V. (1966). Associative strength and paired-associate learning in elderly subjects. *Journal of Gerontology,* **21,** 278-280.

Lau, S., Figuerres, C. and Davis, J.K. 919810. Re-examination of the relationship between locus of control and field independence / dependence. *Percept. Mot. Skills*, **53**, 555-561.

Marko, J. Aging and performance on implicit memory tasks. A brief review. *International Journal of Neuroscience,* **82** (3-4), 155-161, 1995.

Mathew, S.J. Age-related change in visual information processing : Toward a unified theory of aging and visual memory. *Current Psychology : (Developmental, Learning, Personality, Social),* **16** (3-4), 284-307, 1988.

McKinnon, D.F., and Squire, L.R. Autobiographical memory and amnesia. *Psychobiology*, **17**, 247-256, 1989.

Mcmulty, J.A. and Caird, W. Memory loss with age retrieval or storage. *Psychological Reports,* **19** (1), 229-230, 1966.

Nyberg, L., Backman, L., Erngrund, K., Olofsson, U., and Nilsson, L.G. Age differences in episodic memory, semantic memory and priming : Relationship to Demographic intellectual and biological factors. *Journal of Gerontology,* **51B**(4), 2434-240, 1996.

Ohlsson, M. Information processing related to physical fitness in elderly people. *Report from the Institute of Applied Psychoogy,* **71**, 1-12, 1976.

Paivio, A. Mental imagery in associative learning and memory. *Psychological Review,* **76,** 241-263, 1969.

Paivio, A. *Imagery and Verbal Processes.* New York : Holt, Rinehart and Winston, 1971.

Park, D.C. Ageing and Memory : Mechanisms Underlying Age Differences in Performance. *In Proc. of World Congress of Gerontology,* Adelaide, Australia, 69-72, 1997.

Park, D.C., Puglisi, J.T., and Sovacool, M. Memory for pictures, words and spatial location in older adults : Evidence for pictorial superiority. *Journal of Gerontology,* **38,** 582-588, 1983.

Park, D.C., Puglisi, T.J., Sovaccol, M. Picture memory in older adults : Effects of contextual detail at encoding and retrieval. *Journal of Gerontology,* **39**(2), 213-215, 1984.

Park, D.C., Cherry, K.E., Smith, A.B., and Lafronza, V.N. Effect of distinative context on memory for objects and their locations in young and elderly adults. *Psychology and Aging.* **5**, 250-255, 1990.

Park, D.C., Hertzog, C. Kidder, D.P., Morrell, R.W. *et al.,*. Effect of age on event-based and time based prospective memory. *Psychology and Aging,* **12** (2) 314-3127, 1997.

Perlmutter, M., and Nyquist, L. Relationship between self-reported physical and mental health and intelligence performance across adulthood. *Journal Gerontology,* **45,** 145-155, 1990.

Perimutter,M., Adams, C., Berry, J., Kaplan, M., Person, D., and Verdonik, F. Aging and memory. *Annual Review of Gerontology and Geriatries,* **7,** 57-92, 1987.

Perlmutter, M., Metzger, R., Miller, R., and Nezworski, J. Memory for historical events. *Experimental Aging Research,* **6**, 47-60, 1980.

Pershad, D. and Wig, N.N. PGI memory scale. A normative study on elderly subjects. *Indian Journal of Clinical Psychology,* **4,** 6-8, 1997.

Poon, L.W. Differences in human memory with aging : Nature, Causes, and Clinicla implications. In J.E. Birren and K.W. Schaie (Eds.). *Handbook of Mental Healtth and Aging.* Englewood Clifs, N.J. : Prentice-Hall, 1985.

Poon, L.W., Fozard, J.L., Paulshock, D.R., and Thomas, J.C. A questionnaire assessment of age differences in retention of recent and remote events. *Experimental Aging Research,* **5**, 401-411, 1979.

Ramamurti, P.V. and Jamuna, D. *Markers of Successful Aging.* sandoz Project Report, SFGDR, Basle, Switzerland, 1992.

Ramamurti, P.V. and Jamuna, D. Psychological research on the aged in India. *Journal of Anthropological Society of India,* **19**(3), 309-331, 1984

Ramamurti, P.V., and Jamuna D. Perspectives of Geropsychology in India : A review. *Indian Psychological Abstracts and Reviews,* **2** (2), 207-267, 1995.

Ribot, T. *Diseases of Memory.* New York : Appleton, 1882.

Rissenberg, M., and Glanzer, M. Picture superiority in free recall : The effects of normal aging and primary degenerative dementia. *Journal of Gerontology*, **41**, 64-71, 1986.

Rosenberg, M. *Society and the Adolescent Self-image.* Princeton : Princeton University Press, 1965.

Rybarczyk, B.D., Hart, R.P. and Harkins, S.W. Age and forgetting rate with pictorial stimuli. *Psychology and Aging,* **2** (4), 404-406, 1987.

Rybash, J.M. Memory aging research : Real life and laboratory relationships. *Applied Cognitive Psychology*, **10**(3), 187-191, 1996.

Salthouse, T.A. The role of experience in aging. *Annual Review of Gerontology and Geriatrics,* **10** (1), 101-124, 1987.

Salthouse, T.A. How many causes are there of aging-related decrements in cognitive functioning ? *Developmental Review,* **24**(4), 413-437, 1994.

Shepard, R.N. Recognition memory for words, sentences, and pictures. *Journal of Verbal Learning and Verbal Behaviour*, **6**, 156-163, 1967.

Siegler, I.C., McCarty, S.M., and Logue, P.E. Wechsler memory scale scores, selective attrition and distance from deatlh. *Journal of Gerontology,* **37** (2), 176, 1982.

Talland, G.A. Three estimates of the word span. *The Gerontologist*, **7,** 4-9, 1965.

Thomas, J.C., Waugh, N.C., and Fozard, J.L. Age and familiarity in memory scanning. *Journal of Gerontology,* **33** (4), 528-533, 1978.

Trahan, D.E., Larrabee, G.J., and Levin, H.S. Age-related differences in recognition nmemory for pictures. *Experimental Aging Research,* **12,** 147-150, 1986.

Treat, N.J., Poon, L.W., Fozard, J.L. and Popkin, S.J. Towad applying cognitive skill training to memory problems. *Experimental Aging Research,* **4**, 305-319, 1978.

Troyer, A.K., Graves R.E., and Cullum, M.C. Executive functioning as a mediator of the relationship between age and episodic memory in healthy aging. *Aging and Cognition,* **1** (1), 45-53, 1994.

Tulving, E. Episodic and semantic memory. In E. Tulving and W. Donaldson (Eds.). *Organization of Memory.* New York : Academic Press, 1972.

Verhaeghen, P., Marcoen, A. and Goossens, L. Improving memory performance in the aged through mnemonic training : A Meta-analytic study. *Psychology and Aging*, **7**, 241-251, 1992.

Webster's Third New International. Springfield, Mass : J & C Merrian Co., 1967

Wechsler, D. (1945). A standardized memory scale for clinical use. *Journal of Psychology,* **19,** 87-95, 1945.

Weingartner, H., Cohen, R.H., and Burnney, W.E. Memory-learning impairments in progressive dementia and depression. *American Journal of Psychiatry,* **139,** 135-136, 1982.

Witkin, H.A., and Goodenough, D.R. Field dependence na dinterpersonal behaviour. *Psychol. Bull.* **84,** 661-689, 1977.

Woodworth, R.S. and Schlosberg, H. *Experimental Psychology.* New York : Henry Holt and Co. , 1954

Zacks, R.T. Hasher, L., and LI. K.Z.H. Human Memory. In F.I.M. Craik and T.A. Salthouse (Eds.). *Handbook of aging and Cognition* (2nd Ed.) Mahwah, NJ : Erlbaum., 2000.

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Dietary Patterns and its Relation to Disease Profile in Postmenopausal Women

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ABSTRACT

Changes in dietary patterns, physical activity and lifestyle occurring during late middle age in women, may have an impact on the health of the individuals as they turn into the elderly population. The objectives were to study the dietary pattern, disease profile and anthropometric profile in relation to income from 150 women, aged 45-58 years belonging to affluent (Gp A; n=75) and middle-income (Gp M; n=75) class. A highly significant difference was seen in the intake of pulses, fruits, milk and milk products between the two groups - the total consumption for Group A being much higher than Group M subjects.

The major confirmed chronic degenerative chronic diseases reported were hypertension (34%), osteoarthritis (27%), multiple disorders (CVD, diabetes and blood pressure, 7%), and 59 subjects (39.3%) complained of symptoms which were suggestive of disorders of one or more systems of the body. Of the 150, the percent of subjects who reported to be healthy having no symptoms of disorders or disease was 31.3%. Forty-five percent of the subjects from Gp A and 33% from Gp M had reached menopause. Another 15% of the women were suffering from irregular periods. The mean

age for menopause was 46 years. The complaints of these women were mental irregularities, gastric upsets, hot flushes, depression, diminished stamina, fluctuations in moods, irritability, stiffness and pain in joints, memory lapses and headaches. Our results clearly indicated that, as age advanced there was a tendency for the subjects to make changes in their dietary habits. Some of these changes occurred because of the presence of diseases in the subject or in the family. Others were apparently mediated by an increased health consciousness and a desire to avoid excess gain in body weight.

Keywords : Dietary patterns, Disease profile, Life style, Post menopause.

There is a strong association between nutrition and many degenerative disorders commonly affecting the ageing. As the population base shifts its mean age upwards, it becomes increasingly important for health care practitioners, managers and planners to understand the dietary and nutrient intake patterns and requirements of the middle aged and age-related health disorders, both of which are closely linked to the socio-economic condition of the population.

Late middle age is a particularly important period for both men and women as it is during this period that age related disorders begin to manifest themselves overtly. Among these, the CVD, Diabetes Mellitus and osteoporosis are increasingly engaging the attention of the nutritionists. Available epidemiological data, chiefly from the western countries shows that the appearance of some of these diseases in middle age is exacerbated by affluence, plentiful supply of foods, especially the energy rich ones, and excessive consumption of refined foods and relative lack of exercise in the middle age. Others such as osteoporosis may be aggravated by inadequate intake of one or more nutrients as the age advances (Besdine, 1982).

Data available from India on these aspects is scanty and fragmented. Direct studies on the extent of changes occurring due to increased affluence have not been carried out. This study is therefore a small step in the direction of filling the gap and was planned with the major objective of assessing the dietary patterns and its relation

to disease profile in postmenopausal women belonging to upper and middle income groups.

Methods and materials

Subject selection:

The subject selection has been described in part I of the paper (Nambiar and Seshadri, 2002). Seventy-five women in the age group of 45 to 58 years, belonging to affluent class (Gp A, n=75) and 75 belonging to middle income group (Gp M, n=75) were enrolled for the present study from a large corporate sector.

Tools for data collection:

Socio-economic background data were elicited using a pretested questionnaire. This included details about the age, marital status, religion, ethnic group, education, family composition, income and health related habits.

Dietary intake and data was collected using the 24-h dietary recall method. This was followed by questions to ascertain if the previous 24h were representative of their usual dietary pattern. All foods consumed by the subject on the previous 24 h were recorded in household measures, which were then converted to standard measures. Information about foods bought from outside and amount of such foods was also elicited by careful questioning. The raw food equivalents of the cooked foods were calculated from the recipe. The intake of energy, protein, fat, iron, calcium, vitamin C and beta-carotene were calculated using the Nutritive value of Indian Foods (Gopalan *et al.,* 1993). Data was also elicited on the changes made in the dietary patterns over the years and their perceptions towards various food groups by in-depth interviews with the subjects.

Disease profile schedule included a free listing of the ailments/disease present in the subjects, their actual antecedent health records (from the corporate health centre) for the past 10 years which included their major/minor illnesses, hospitalization, operations/accidents and allergies; any prolonged medication or drug causing side affects was elicited. Their past maternal history was also collected through in-depth interviews with the subjects.

A checklist was also made which included a list of problems related to gastrointestinal system, respiratory tract, cardiovascular system, genitourinary system, nervous system, endocrine and miscellaneous problems using the following procedure:

1. A list of commonly occurring ailments in the middle aged and elderly was obtained (White, 1989)
2. Symptoms of the diseases as used in the medical dictionary were referred and translated into operational terms that could be understood by the subjects.
3. These schedules were pretested on 30 subjects and any disorder or disease missed out in the schedule was added.
4. These schedules were then scrutinized by three experienced physicians and the final modified schedule was used for data collection.

Results and discussion

Socio-demographic attributes

The socio demographic attributes (Table 1) of the subjects in the present study show that age, by selection was in the range of 45 to 58 years, most were married, Hindus and had stayed in Gujarat for more than 10 years. There was also a marked and significant difference in the total as well as per capita income of the two groups i.e. Gp A and Gp M. The economic variations were also seen by the higher percentage of Gp M cadre women and children who were working compared to Gp A women and children. Thus by per capita income, number of years of education and occupation of spouses, the two groups were distinctly different. The supervisory represented the affluent in India and the non-supervisory the so-called middle-income group. In the subsequent sections, the major focus is on the differences in dietary intake and health disorders profile and the inter-relationships. The chief objective is to identify if the affluent groups are at a greater risk of certain nutrition related problems then the middle-income groups.

The women subjects of the present study did not have any health impairing habits except for one (alcohol and chewing tobacco). Thus the modern hazards to health were practically absent in the subjects.

Table 1: Socio-demographic attribute of the women subjects (45-58 years) in the two Income groups

Socio-demographic attributes	Group A – HIG (n=75) (%)	Group B -MIG (n=75) (%)	Total (n=150) (%)
Age (yr)			
< 50 yr	73.33	26.67	68.00
>50 yr	32.00	70.67	29.33
Marital status			
Single	0.00	98.67	1.33
Married	4.00	76.00	20.00
Divorced/widow	2.00	87.33	10.67
Religion			
Hindu	92.00	8.00	97.33
Muslim	2.67	94.67	5.33
Ethnic group			
Gujarati	42.67	57.33	88.00
Non-gujarati	12.00	65.33	34.67
Resident in Gujarat since			
< 10 yr	0.00	100.00	0.00
>10 yr	100.00	0.00	100.00
Total no of years of education	13.44±0.44	10.44±0.65	12.04±0.41
Education level			
Primary	94.67	89.33	61.33
Higher secondary	16.00	80.00	57.33
Graduate	33.33	13.33	87.33
Post graduate	73.33	47.33	14.67
Occupation			
Working	20.00	80.00	48.00
Non-working	52.00	34.00	66.00
Husband's occupation			
Supervisory	100.00	0.00	0.00
Non-supervisory	100.00	50.00	50.00
Total no. of family members	4.49±0.14	4.39±0.17	4.44±0.11

Changes Made in the Food Pattern by the Subjects

Changes made by the subjects in their dietary patterns in the past five years as per their own admission are shown in Table 2. Trends were similar for the Gp A and Gp M subjects. The major changes were a reduction in starchy and fatty foods (i.e. fried foods, edible fats and oils) followed by a reduction in sweets and sugar and sour foods. Reduction in salt intake was reported by 22% and hard to chew foods by 12%. The reasons for change suggested high level of awareness concerning nutrition related information. Most of the subjects said they reduced the intake of starchy foods, fats, sugar and sweets to control their body weight and to maintain adequate health as their age advanced. While the 24-h recall supports the restriction of starchy foods, the intake data does not indicate considerable restriction in fats. This is discussed in the next section. The restriction in sour food by some subjects was related to certain health disorders like gastrointestinal problems and bone joint pains, which were believed to be aggravated by consumption of sour foods. Some subjects reported that they reduced their sugar intake due to a family history of diabetes. Restriction of salt consumption was chiefly related to the prevalence of hypertension in 25 subjects.

Table 2: Changes made in food pattern of women aged 45-58 y in the past 5 years in the two groups

Food items	% v in MIG	% V in MIG	% No change in MIG	% v in HIG	%V in HIG	% No change in HIG	Total % v	Total % V	Total % No change
Starchy foods	46.67	8.00	45.33	64.00	2.67	33.33	56.67	5.33	38.00
High fibre foods	10.67	20.00	69.33	10.67	2.67	86.66	10.67	11.33	78.00
Fatty foods	72.00	4.00	24.33	80.00	1.33	18.67	77.33	2.67	22.00
Sour foods	41.33	0	58.67	36.00	2.67	61.33	39.33	0.67	60.00
Sugar and sweets	45.33	7.00	46.67	48.00	1.33	50.67	47.33	2.00	50.67
Salty and salty foods	25.33	6.67	68.00	20.00	2.67	77.33	22.67	2.67	74.66
Legumes	12.00	4.00	84.00	18.67	1.33	80.00	15.33	0.67	84.00
Hard to chew foods	6.67	5.33	88.00	18.67	1.33	80.00	12.67	0.67	86.66

Thus, results clearly indicated that, as age advanced there was a tendency for the subjects to make changes in their dietary habits. Some of these changes occurred because of the presence of diseases in the subject or in the family. Others were apparently mediated by an increased health consciousness and a desire to avoid excess gain in body weight. Income was not a major factor influencing these changes as both Gp A and Gp M subjects reported of similar changes they had made in the past five years.

Mean Dietary Intake (Food Group Wise) in the Subjects

Consumption levels of various types of food stuffs by the two different occupational classes are indicated in Tables 3. A highly significant difference was seen in the intake of pulses, fruits, milk and milk products between the two groups, the total consumption for Group A being much higher than Group M subjects. Gp A consumed significantly more milk and milk products explaining that difference in the calcium intake between the two groups (part I). Since bone mineral density is significantly associated with body weight and dietary calcium, it may be predicted on the basis of their current dietary habit that osteoporosis may not be an emerging problem for these affluent and middle class women of India.

Table 3 : Mean dietary intake (Food Group wise) in women aged 45-58y in the two income groups

Food groups (g)	Gp A	As % RDA	Gp M	As % RDA	Total	't' value
Cereals	149.87±7.39	74.5	155.67±7.38	77.8	152.77±5.21	-0.56
Pulses	71.00±5.53	118.3	45.53±4.61	75.9	58.27	3.54*
GLVs	72.01±9.61	72.0	96.80±10.52	96.8	84.41±7.10	-1.76
Roots and tubers	101.93±9.90	134.7	87.40±7.83	116.5	94.67±6.32	1.15
Other vegetables	119.43±10.29	238.0	124.73±11.75	249.5	122.08±7.78	-0.34
Fruits	149.27±16.53	496.7	74.13±11.07	247.1	11.70±10.38	3.78*
Milk and milk products	374.13±22.79	187.1	234.53±21.11	117.3	304.33±16.50	4.49*
Fats and oils	46.73±2.65	155.8	46.80±2.72	156.0	46.77±1.89	-0.02
Meat/fish/poultry	15.47±5.93	-	0.00	-	7.73±3.02	2.61
Sugar and jaggery	41.20±2.89	136.7	46.40±2.00	154.7	43.80±1.76	-1.48

Meat and flesh foods intake was reported only by the affluent class but constituted a small proportion of the total intake (1.5%). Small differences in vegetable consumption were also seen; Gp A had more roots and tubers whereas the Gp M had higher consumption of GLV and other vegetables. However cereals, fats and oils and sugar consumption were nearly same in both the groups. Achaya (1988) has shown that dietary fat from invisible fat contributed to 4.8 to 7% calories in Indian meals. Excess linoleic acid could lower HDL cholesterol which is not desirable from the point of view of susceptibility to coronary heart disease.

Table 3 also shows the food consumption data of the present subject in relation to the RDA made by the ICMR (1989).The mean intake for all food groups is equal to or in excess of RDA except for the cereals and GLVs in Gp A subjects and cereals and pulses in the Gp M subjects. On the whole dietary intake of the Gp A subject was satisfactory, while that of Gp M subjects had some deficiencies. This data emphasizes the fact that nutrient intake (especially calorie and fat) increases with income as discussed in Part I of this paper (Nambiar *et al*., 2002).

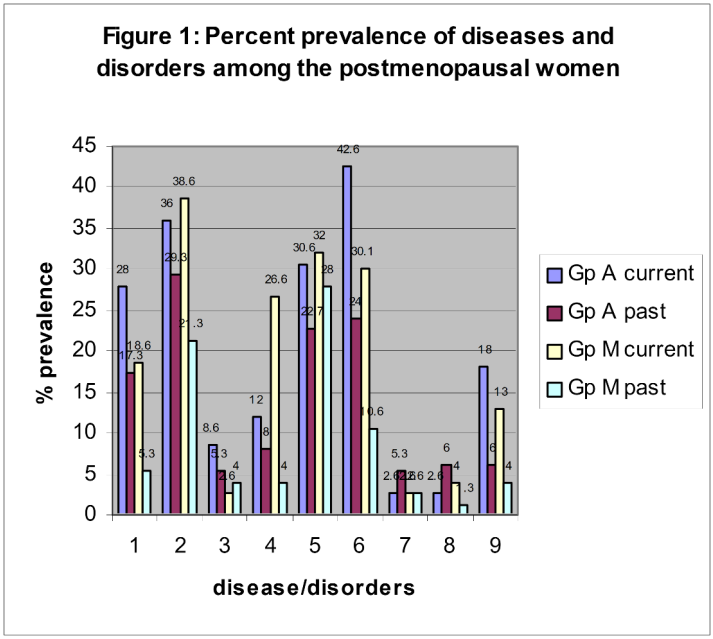
Disease Profile of The Subjects

Two types of data were obtained, one related to the presence of confirmed chronic degenerative diseases and the other- presence of symptoms which suggested disorders of one or more systems of the body. The latter do not imply a disease but the possibility of a disease manifesting itself.

Of the 150, 44 subjects (29.4%) suffered from some chronic degenerative disease. The major confirmed chronic degenerative chronic diseases reported were hypertension (34%), osteoarthritis (27%), multiple disorders (CVD, diabetes and blood pressure, 7%), and 59 subjects (39.3%) complained of symptoms which were suggestive of disorders of one or more systems of the body. Of the 150, the percent of subjects who reported to be healthy having no symptoms of disorders or disease was 31.3% (Figure 1).

Two thirds of all the subjects reported that they had symptoms which were suggestive of a possibility of certain disease. These for convenience of presentation are divided into various systems of the

human body. Figure 1 show that there is a marked difference between the disease profile of the Gp A and Gp M subjects. A higher incidence of oral cavity problems was seen in the Gp A (28% vs 18.6%) whereas a higher incidence of respiratory problems was seen in the Gp M subjects. Other symptoms related to hepatobiliary, pancreas, urino-genital systems were present in small percent in both the groups (6.6 vs 2.6%). Sixty-five percent and 58% of the women had reading glasses in Gp A and M respectively. 4% of the women in Gp A had hearing problems.



1-oral cavity; 2-GIT; 3-hepatobiliary/pancreas/piles/appendix/irinogenital; 4- respiratory; 5-locomotor ; 6-CNS; 7- endocrine system; 8-misc (fever/malaria); 9-anemia

Symptoms related to anemia

Several subjects in the present study reported fatigue and breathlessness. These subjects when clinically examined were found to show pallor. On the basis of this 18% of the Gp A and 13% of Gp M subjects showed symptoms suggestive of anemia. This was not surprising because the dietary intake revealed gross deficit in iron in both the groups. The heamoglobin mass is reported reduced as the

age advances. Ventura *et al.* (1983) reported that these symptoms of anemia may often be mistaken for blood vessel disease. Such symptoms are erroneously referred to as involvement of arteries instead of iron deficiency. Webster (1977) cautions that breathlessness, fatigue and ankle edema should not be considered merely symptoms of ageing. They may well be early built reversible signs of anemia.

Symptoms related to the locomotor system

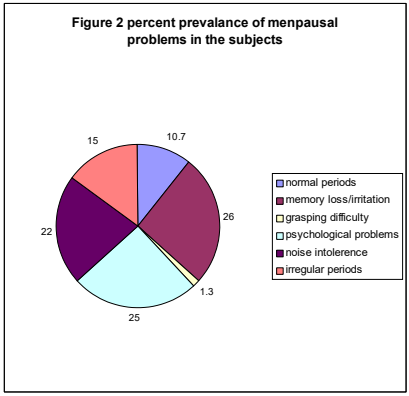
Twelve percent of the subjects reported of chronic lower back pain, 9% of spondylosis and 8% of osteoarthritis. Tollison et al (1991) have reported that low back pain is one of the most prevalent psycho-physiological disorders, which creates severe social, medical and economic problems for women patients in the US. Regular stretching exercises are reported to be an integral part of rehabilitation programme for such patients. None of the women subjects in the present study had been tested for osteoporosis. In the present study the mean intake of calcium was more than twice as high as the RDA in both the groups (Nambiar and Seshadri, 2002), which suggests that nutritional risks of osteoporosis maybe low in these subjects.

Psychological problems

In the present study, 40% subjects reported of tension headaches, 8.6% reported of migraine type headaches and 19.5% reported sleep disturbances. Twenty five percent of the women suffered from psychological problems, especially depression. This was because either they had grown up children who had moved away due to marriage/service or because of college going children who were too busy to share their time with their mothers. Such a susceptibility to pain during aging has been discussed by Enck (1991). Ageing causes unique physiological changes that directly affect the patient's perception to pain as well as the body's ability to react to various analgesics. Pain occurs commonly with disease and dysfunction in the home-based aged and a host of age related changes make these patients a special challenge to the primary care physicians. Atleast some of these problems experienced by these women maybe related to menopause.

Menopausal problems

Out of 150 women studied 45% of the subjects from Gp A and 33% from Gp M had reached menopause. Another 15% of the women were suffering from irregular periods. The mean age for menopause was 46 years. The complaints of these women were menstrual irregularities, gastric upsets, hot flushes, depression, diminished stamina, fluctuations in moods, irritability, stiffness and pain in joints, memory lapses and headaches (Figure 2). Thus some of the health problems stated earlier maybe associated with the endocrinological and biochemical changes in this age.



To summarize the disease profile, it can be said that with the advancing age, women of the middle income group were more prone to respiratory system related problems than the women of the affluent group, although problems related to atherosclerosis such as hypertension and hyperlipidemia were not more common among the affluent class women than the middle class women. Advancing age also resulted in deterioration of health in both the groups, the most prominent being problems related to GIT, respiratory tract, locomotor system and central nervous system.

Confirmed Health Problems of the Subject and their relationship with anthropometric measurements and nutrient intake.

Table 5 shows that the mean body weight, mid upper arm circumference and body mass index was significantly higher for the non-healthy group with confirmed hypertension, heart disease, diabetes mellitus and hyperlipidemia compared to the healthy group.

Table 4: Mean anthropometric measurements of healthy subjects as compared to the ones reporting confirmed high BP, diabetes mellitus, heart disease and hyperlipidemia

Group	Ht (cm)	Wt (kg)	MUAC (cm)	Sum of SFs (mm)	BMI
Healthy	153.3±0.95	55.6±1.75	27.1±0.62	35.0±1.15	23.5±0.73
Subject with confirmed problems	155.9±135	62.9±1.35	29.4±0.53	36.7±1.78	25.7±0.66
't' value df 72	0.9777 ns	2.644*	2.459*	0.833*	2.00*

Values are mean ±SE p< 0.05

Table 5: Mean calories and fat intake for the subjects wit no disorders vs ones reporting confirmed high BP, diabetes mellitus, heart disease and hyperlipidemia

Group	Calories Kcal)	Fat gm)
Healthy subjects (n= 125)	1733.38±561.39	63.09±24.09
Subjects with confirmed high BP, heart disease, DM etc (n=25)	1880.04±565.82	76.57±34.51
't' value	0.18 ns	1.74 ns

Values are mean ± SE p£ 0.05

Abraham *et al.* (1987) who studied the nutritional status of hospital out-patients also found that diabetic and cardiac patients had significantly higher body weight and other anthropometric indices. The extent of overweight in their patients was the same as in the present study. The diabetic and cardiac patients in their study had a mean body weight of 64 and 62 kg respectively whereas in the present study these disease groups were combined and the mean body weight was found to be 62.9 kg which is much higher in comparison to their mean height (155.9 cm). Body weights exceeding 20% above desirable weights constitute an established health hazard. The energy (1880 vs 1733KCal) and fat (76.6 vs 63.1gm) intake of the subjects with confirmed chronic degenerative disorders were higher than the healthy subjects. These differences were not significant. At the household level of these subjects, no difference was seen in the type of edible oils purchased or consumed.

However, since in women, there seems to be a higher increase in total cholesterol and LDL-C after 60 years, recommendations may concern some lowering of saturated fat but not drastically. More importantly, weight reduction and maintaining normal blood pressure (with or without salt restriction) will be good. The saturated fat may form 7% of total calories for vegetarians as another 7% may come from MUFA and 7% from PUFA. For a women requiring 2000 cal/day, 7% means 140 Kcal from saturated fat i.e., 15gm/day, which means only 3 teaspoons of ghee (a clarified butter, consumed by Indians). Rest of 6 tsp may come from other fats and oils.

Discussion

Disease profile of the subjects change markedly with age. Income also had an impact on the disease profile of the subjects. When current health disorders were compared with those of past ten years, significant increase was seen in the prevalence of some symptoms, which were mainly related to the oral cavity, GI, respiratory system and central nervous system. In the confirmed chronic diseases, high blood pressure ranked first followed by arthritis, heart problems and diabetes mellitus and a combination of one or more of these.

When energy and fat were compared between the groups with chronic degenerative diseases and the one with no disease, it was found that fat intake was higher in both the groups as compared to the RDA. Of the two groups, the non-healthy group of subjects had a higher mean fat intake but it was not statistically significant. A similar trend was seen for the energy intake. The anthopometric profile of the subjects with confirmed health disorders was significantly different from the healthy subjects. Mean body mass index were significantly higher for the women who has confirmed hypertension, heart problems and diabetes mellitus. Menopausal problems appeared to influence many symptoms related to GI and central nervous systems.

Thus, from the parameters studied and the results obtained, it can be concluded that the middle age is a turning point for the onset of several changes in the lifestyle as well as the disease profile. This group should therefore be dealt with special attention such that their enhanced life expectancy would allow them to lead a healthy life as active senior citizens of our nation.

References

Achaya, K.T In: NFI Bulletin. *Bulletin of the Nutrition Foundation of India*. New Delhi. Vol 9. No 2. 1988.

Abraham, U, Sheela, M.L, Shridhar, L.B.R and Shetty, P.S: Nutritional assessment of hospital outpatients *Ind J Med Res*: 85: 436-442, 1987.

Besdine, R.W. The database of geriatric medicine. In *Health and Disease in old age* (Rowe J.W, Besdine R.W Eds). Boston, Little Browm & Co. 1982.

Enck, R.E. Pain control in the ambulatory elderly. *Geriatric*: 46(3):49. 1991.

Gopalan, C.: *Nutritive value of Indian Foods*, National Institute of Nutrition.

Hyderabad, 1993. ICMR, Indian Council of Medical Research, *Recommended dietary allowances for Indians*, pp 14-41, 1989.

Jellife, D.B.: *The assessment of nutritional status of the community* (with special reference to field surveys in regions of the world), World Health Organization Monograph series No 35, WHO. Geneva 1966.

Mehta, P. and Nambiar, V.S.: *Ageing, health and Nutrition*. Department of Foods And Nutrition, Faculty of Home Science. M.S. University of Baroda. Vadodara. Gujarat. India, 1999.

Nambiar, V.S. and Seshadri, S. Relationship between socio-demographic indicators, income, lifestyle and caloric intake in postmenopausal women. *Indian Journal of Gerontology* vol.16, Nos.3&4, 2002.

Tollison, C.D, Kriegel, M.L and Satterwaite, J.R. Comprehensive treatment of acute and chronic low back pain. A clinical outcome comparison. *Orthapaed Rev:* 1(2): 10-19.1991.

Ventura, A and Senin, E.N. Iron pathology in the elderly. *Biblitha Nutr Dieta*: 33:113-120. 1991.

Webster,S. Anemia: How many cases go unrecognized? *Mod Geriat*:7:27-32.1977.

White,P. Addressing critical issues in care of elderly. In *Health care of the elderly and information source book*: 11-25.1989.

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2004, Volume 18, Nos. 1, pp. 73-84

Correlates of Serum Albumin Levels Among Home-Bound Male Elderly

Sujatha Ramamurti and D.Divya

ABSTRACT

The elderly population of India is fast on the increase and many of them are in the low income groups living in rural areas. Low Serum albumin levels among them cause a host of health problems. This study examines the serum albumin levels of the elderly and several other nutrients and their intercorrelations.

Key words : Nutrient status in elderly, serum albumin

The very name 'protein' (*Gk. meaning, primary or first*) gives an indication of the value placed on this nutrient. In fact, more than 15% of the average human body by weight is protein. There are large varieties of proteins in the body with a wide range of specialized functions and characteristics. The body utilises protein for growth, maintenance and repair of tissues, as well as for energy.

Protein metabolism of elderly people is affected by the reduction of muscle protein, an important feature of ageing. Because of the smaller muscle mass, elderly people have a smaller protein turnover than younger adults. Further more, ill health, trauma, sepsis and immobilization may disturb the balance between protein synthesis and degradation in this segment of population. Short term restriction of dietary protein has been shown to decrease the rates of whole body protein synthesis and turn over in man (Chan *et al.,* 1995). As a result of poor digestive capacity and decreased appetite, the elderly are likely to consume less proteins leading to protein deficiency. The ICMR recommended allowances of protein is 60 and 50g/day for elder male and female respectively. Campbell *et. al.,* (1994) stated that a safe protein intake for elderly adults would be 1.0 to 1.25g/kg body wt / day of high quality protein. Kelman *et. al.,* (1972) examined the effects of dietary protein restriction on albumin

synthesis, albumin catabolism and the plasma aminogram. It was found that protein malnutrition in the elderly, is associated with low plasma albumin and characteristic aminoacid changes.

Albumin is the major protein produced in the liver. Albumin is needed for transport functions, for maintaining fluidity of the vascular system and for the prevention of edema. Acute change may be produced by large reductions in protein intake or by trauma and infectious diseases.

Protein – energy malnutrition is a serious nutritional problem in the elderly. The concentrations of albumin and total protein in serum have been used as the biochemical indicators of protein nutritional status. Many studies revealed that the concentration of albumin in serum is associated with health and nutritional status among the elderly (Cohen *et. al.,* 1992; Salive *et. al.,* 1992; Corti *et. al.,* 1994; Baumgartner *et. al.,* 1996). Serum albumin was found to be the most sensitive marker of malnutrition (Belbrauer *et. al.,* 1998; Murayama *et. al.,* 1999). An association of low serum abumin concentrations with increased mortality as well as morbidity was shown and possible protective effects of high concentrations were described. Patients with low serum albumin levels (< 34g/L) were more likely to die, had longer hospital stays and were readmitted sooner and more frequently than patients with normal albumin levels (4-4.5 g/dl). Serum albumin levels decrease with age and values < 38g/L, are associated with increased morbidity, mortality and disability in the elderly. Decreases with age in serum albumin levels are associated with muscle loss (sarcopenia) in the elderly. Although hypo albuminemia is commonly regarded as marker of primary protein energy malnutrition, it may be associated with infection, inflammation, surgical stress, trauma and liver and renal diseases (Rothchild *et. al.*, 1988).

As the research efforts are inadequate to provide an understanding on correlates of serum albumin levels and the literature from Indian studies on this aspect is scanty, an attempt was made to study the correlates of serum albumin levels in the home bound male elderly.

Methodology

The sample : A purposive sample was drawn consisting of 120 subjects, all men, of age 65-75 years. The sample was drawn from

different villages of Chittoor District and Tirupati town, Andhra Pradesh. The subjects were selected on the basis of their age, income and place of residence. Among 120 subjects; 30 were from Rural Low Income Group (RLIG), 30 were from Rural Middle Income Group (RMIG), 30 were from Urban Low Income Group (ULIG) and the other 30 from Urban Middle Income Group (UMIG).

Biochemical Analysis : Blood samples were collected from each subject. Serum was prepared for the estimation of protein and albumin by the Reinhold method, 1966 (Raghuramulu *et. al.,* 1983). Haemoglobin was estimated by the modified method of cyanmethaemoglobin (Annual Report NIN, 1974).

Enumeration of WBC (Total Lymphocyte Count) : The method involves an accurate dilution of a measured quantity of blood with fluid which is isotonic with the blood and which will prevent its coagulation. A dilution of 1 to 20 is necessary. The diluted blood is placed in a counting chamber and the number of cells in a circumscribed volume is enumerated under a microscope.

A three day diet survey was carried out in the sample, the raw weight equivalents of cooked weights of various recipes were determined in the laboratory. Based on the information given by the subjects, average nutrient composition was calculated, using tables of food composition (Gopalan et al., 1996). The anthropometric data was recorded and BMI (Body Mass Index) for each subject was calculated by using the standard formula weight (kg) / Height^2 (m).

The data recorded in biochemical analysis, diet survey and anthropometry was tabulated and subjected to statistical analysis. Students 't' test was done to assess the significance of difference in mean values of 2 sets of data. Pearson's correlation co-efficient values (r) were calculated to determine the relationships among different variables, especially the correlates of albumin levels.

Results and Discussion

The serum total protein, albumin, albumin/globulin ratio, haemoglobin and WBC count values are given in Table –1.

In the total sample, the total protein levels ranged from 5.70 to 7.20 g/dl, with a mean value of 6.26±0.49 g/dl. When compared against the normal value of 6 to 8 g/dl, the mean value is lower

(Table 1). Of the 4 groups, RMIG showed the highest mean value i.e., 6.41. The difference in the total protein levels of RLIG & RMIG groups was statistically very significant. (6.01 vs 6.41) (P< 0. 001). All the subjects of the sample showed lower total protein levels, compared to normal. There was a shift of values towards higher ranges in MI groups.

TABLE - 1: Average, Group Range and Grand Mean Values for Serum Total Protein, Serum Albumin, A/G Ratio of Subjects of Different Groups in the Sample

Groups	Serum Total Protein (g/dl) Mean ± SD Range	Serum Albumin (g/dl) Mean ± SD Range	A/G Ratio Mean ±SD Range
RL	6.01±0.41 (5.20 - 6.90)	3.54 ± 0.34 (3.00 - 4.20)	1.41 ± 0.21 (1.09 - 2.10)
RM	6.41 ±0.50 (5.70 - 7.50)	3.77 ± 0.40 (3.10 - 4.50)	1.43 ± 0.30 (1.00 - 2.30)
UL	6.30 ± 0.55 (5.40 - 7.20)	3.61 ± 0.40 (3.00 - 4.50)	1.34 ± 0.26 (1.00 ± 1.96)
UM	6.30 ± 0.41 (5.70 - 7.20)	3.69 ± 0.33 (3.30 - 4.50)	1.42 ± 0.298 (1.06 - 2.20)
Grand Mean	6.26 ± 0.49 (5.70 - 7.20)	3.66 ± 0.38 (3.00 - 4.50)	1.40 ± 0.27 (1.00 - 2.30)
Normal Value**	6.0 - 8.0	3.8 - 4.50	

** **Source**: ICMR, 1990.

The serum albumin levels ranged from 3.00 to 4.5 g/dl in the sample, with an average of 3.66 g/dl. Compared to normal of 3.8 to 4.5 g/dl, this is lower. The same trend as in the case of total protein, is seen here also. The mean A/G ratio was 1.40.

Looking at the frequency distribution of the subjects of the four groups, albumin levels, 65% of LIG subjects and 50% of MIG subjects had their levels between 3.0–3.6g/dl. This illustrates the fact that approximately 1/2 to 2/3rd of the MIG and LIG subjects had very low serum albumin levels. A number of studies suggested that serum albumin levels are depressed in the elderly. Low plasma levels of protein in older human subjects than in younger adults were reported. Conditions such as protein energy malnutrition and catabolism may reduce serum albumin levels(Gariballa *et al.,* 1998).

The mean haemoglobim (Hb) levels and WBC count for the sample are given in Table–2. The Hb levels in the whole sample ranged from 8.00 to 13.30 g/dl, with an average value of 10.77 g/dl. This is much lower than the standard value of 13-17g/dl, indicating that all the elderly subjects of the sample were anemic.

Table 2: Average, Group Range and Grand Mean Values for Haemoglobin and WBC count for subjects of different groups of the sample

Details	Haemoglobin (g/dL) Mean ± S.D	WBC count(cells/MM^3) Mean ± S.D
Rural LIG	10.51 ± 1.29 (8.30 - 12.60)	6203.33 ± 1808.69 (3600 - 9200)
Rural MIG	11.16 ± 1.07 (9.30 - 13.00)	6490.00 ± 1682.63 (3600 - 9200)
Urban LIG	10.60 ± 1.48 (8.00 - 13.30)	6443.33 ± 1717.39 (4000 - 9200)
Urban MIG	10.78 ± 0.88 (9.66 - 12.30)	6306.66 ± 1390.34 (4000 - 9900)
Grand Mean	10.77 ± 1.22 (8.00 - 13.30)	6306.83 ± 1640.11 (3600 - 9900)
Normal Value **	13.5 - 17.0	4500 - 11000

Parenthesis : Range;**Source : ICMR, 1992.

The average WBC count (Cell /MM^3) for the whole sample was 6306.83 ±1640.11. Compared to standard norm of 4500–11000, the mean value is lower.

It is generally agreed that there is a decrease in immune responsiveness with increasing age. No single factor or event in the course of ageing has been identified as the cause of immuno-senescence. Indeed what has become evident from the enormous literature in recent years is that the decline in immune response is highly variable with regard to age of onset, severity and manifestation. Extrinsic and intrinsic factors, including genetic differences, socio-economic status, drug effects and underlying diseases may all directly or indirectly influence immune-responsiveness. In particular, malnutrition due to disease or depression has been associated with decreased immuno-competence and risk of infection in old age.

Table - 3: The Average, Group Range and Grand Mean Nutrient Composition of the Diets Consumed by Subjects of Different Groups of the Sample

Groups (mg)	Energy K.cals	CHO (gms)	Protein (gms)	Fat (gms)	Fibre (gms)	Calcium (mg)	Iron (mg)	Vitamin-C
	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D	Mean±S.D
Rural LIG	1270.13±151.88	217.86±36.10	39.11±4.46	15.66±2.41	5.59±1.19	294.00±32.07	17.30±2.32	31.43±6.03
	(1035.00-1605.00)	(171.00-290.00)	(30.00-48.00)	(11.00-21.00)	(3.40-8.20)	(195.00-343.00)	(12.00-22.00)	(25.00-46.00)
Rural MIG	1496.86±102.10	255.70±32.96	42.13±3.11	17.80±1.80	5.03±1.01	304.53±16.07	18.93±2.06	30.26±4.01
	(1180.00-1641.00)	(189.00-292.00)	(37.00-47.00)	(15.00-23.00)	(3.30-6.42)	(244.00-340.00)	(15.00-23.00)	(25.00-40.00)
Urban LIG	1455.10±106.55	222.23±29.89	39.46±3.05	16.63±1.27	5.59±1.12	312.26±34.13	19.13±1.19	28.40±2.98
	(1256.00-1705.00)	(178.00-290.00)	(34.00-46.00)	(15.00-20.00)	(3.36-7.50)	(205.00-397.00)	(15.00-21.00)	(24.00-37.00)
Urban MIG	1846.86±99.34	291.50±39.43	41.86±2.77	21.76±3.11	7.51±1.26	349.60±42.62	22.36±2.83	43.46±5.59
	(1693.00-2091.00)	(245.00-387.00)	(37.00-46.00)	(17.00-27.00)	(4.99-9.99)	(278.00-431.00)	(18.00-29.00)	(33.00-56.00)
Grand Mean	1517.23±239.16	246.83±45.45	40.65±3.64	17.97±3.23	5.93±1.48	31.51±38.51	19.43±2.84	33.39±7.61
	(1035.00-2091.00)	(171.00-387.00)	(30.00-48.00)	(11.00-27.00)	(3.30-9.99)	(195.00-431.00)	(12.00-29.00)	(24.00-56.00)
RDA**	1800.00	–	60.00	40.00	10.00	400.00	28.00	50.00

** **ICMR 1990; Parenthesis - Range**

Total Calories

For the whole sample, the grand mean value was 1517 kcal, with a range of 1035 to 2091 kcal. Compared with RDA of 1800 kcal, it is a much lower value. The caloric deficit in 4 groups ranged from 16 to 29%.

Protein

The mean protein intake in LIG & MIG groups of the sample was 30 and 42 g, respectively. The grand mean value of 40.6 g, was much lower compared to RDA of 60g, indicating a deficit of 32% in protein intake.

In view of the declining energy requirement with age, not accompanied by a decline in protein requirement and the increasing incidence of recurring episodes of chronic diseases in older people that may increase protein needs, it appears prudent to ensure that the elderly received 12% or more of their total calorie intake in the form of protein or atleast 0.6 to 0.8g/kg body weight. When there is depletion of muscle protein in the presence of typically lessened lean body mass, protein intake of 1-1.5g per kg body weight may be indicated for the elderly under some circumstances.

The mean carbohydrate intake for the whole sample was 246 g and that of fat was 18g. Fiber intake was 6 g. Fat and fiber intake was lower compared to RDA.

The grand mean calcium intake of 315 mg and iron intake of 19.4 mg were lower compared to RDA. Ascorbic acid intake of 33.4 mg was also lower compared to RDA. This indicates that there is under nutrition of micronutrients and vitamin among the elderly, making them susceptible to disease and infection.

Correlation Coefficients among the Biochemical and Dietary Parameters :

The correlation coefficient values between the serum total protein, albumin and dietary constituents were calculated for the four groups of the elderly. There was a significant correlation ($P<0.01$) between the dietary protein and serum total protein level in Urban MIG group. A significant correlation ($P<0.01$) was seen between dietary vitamin C and serum total protein level. Serum Albumin level did not correlate significantly with any dietary constituent.

The dietary constituents that were related to haemoglobin levels were protein and ascorbic acid (P<0.05) : Monsen and Balintfy (1982) described the importance of enhancing factors (animal protein and vitamin C) for absorption of non-heme iron, the major source of iron in the diet.

To see whether there are any associations among biochemical parameters, correlations between different biochemical parameters were assessed (vide Table – 4). From this data, it is clear that serum total protein levels of subjects of all the groups significantly correlated with serum albumin (P<0.01), Hb levels of all subjects and with WBC count of rural MIG (P<0.01).

Table - 4 : Correlation Co-efficient Values showing Relationship among serum protein, Albumin, A/G Ratio, Haemoglobin, Blood Glucose and WBC Count.

Details	Serum Protein	Serum Albumin	A/G Raio	Haemo-globin	WBC Count
SERUM PROTEIN					
Rural LIG		0.773**	0.103	0.516**	0.093
Rural MIG		0.798**	0.003	0.821**	0.629**
Urban LIG		0.694**	-0.170	0.838**	0.263
Urban MIG		0.499**	-0.244	0.558**	0.062
SERUM ALBUMIN					
Rural LIG			0.693**	0.662**	0.247
Rural MIG			0.447**	0.572**	0.452*
Urban LIG			0.530**	0.789**	0.612**
Urban MIG			0.692**	0.191	0.453*
A/G Raio					
Rural LIG				0.383*	0.225
Rural MIG				-0.140	0.008
Urban LIG				0.112	0.520**
Urban MIG				-0.202	0.437*
HAEMOGLOBIN					
Rural LIG					0.424*
Rural MIG					0.495**
Urban LIG					0.495**
Urban MIG					-0.027

** P<0.01; * P<0.05

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Serum albumin levels of subjects of all groups significantly correlated with serum total proteins, A/G ratios ($P<0.01$) and $P<0.05$), Hb levels ($P<0.01$) and WBC count ($P<0.01$). The Hb levels significantly ($P<0.01$ and $P<0.05$) correlated with WBC count in the sample. Serum albumin levels significantly correlated with total protein among the elderly. This observation is similar to those observed in surveys of free living British, US and Chinese elderly and in a well controlled metabolic study of healthy young and elderly adults (Spencer *et. al.,* 1987).

Correlates of Serum Albumin in the Aged.

The concentrations of albumin in serum has long been recognized as an indicator of the state of general health and nutrition of the individual. Approximately half of the protein in plasma is albumin. The levels are generally insensitive to short-term changes in protein intake, but may be affected by long-term protein intake and utilization. Protein intake, however, has to drop to relatively low levels to cause hypoalbuminemia in healthy men. It is unlikely that decreased protein intake accounted for the low serum albumin. Munro *et al,* (1987) found that the serum albumin concentration was lower in older subjects, irrespective of the protein content of the diet.

Hypoalbuminemia represents a metabolic response to illness and infection. A decrease in serum albumin represents decreased liver biosynthesis and turnover and its increase parallels nutritional recovery. The magnitude of hypoalbuminemia is proportional to the degree of stress and malnutrition. In a healthy person subjected to moderate stress, serum albumin levels rarely decrease below 30g/l. However, after severe stress, serum albumin can decrease quickly below 30g/l. There is a strong correlation between albumin and immune function. Modest hypoalbuminemia is related to discrete acute phase responses.

Total lymphocyte count (TLC) has been described as a poor man's assessment of immuno competency. WBC count also retained predictive significance with serum albumin levels of the elderly. TLC is often associated with decreased serum albumin levels. Seltzer *et al.*, (1979) reported abnormal TLC associated with a four

fold increase in deaths and abnormal albumin were associated with a six fold increase in both death and complications. In combination, abnormal TLC and albumin resulted in an 8 fold increase in complication rate with a 9 fold increase in mortality. This suggests a strong relation between serum albumin and TLC. Thus, it can be stated that serum albumin level is a specific marker of risk factor by colinearity with low TLC count.

A very important potential aspect of any nutritional evaluation is the assessment of functional changes, which result from malnutrition, particularly changes in immunological function. Virtually every immunological abnormality described in malnutrition has also been documented in the elderly and has been ascribed to effects of senescence. The picture in the case of WBC count of the elderly was not satisfactory. Most of the subjects had their count around 6000 cells/min^3, which implicates a reducedimmune function.

The findings of this study indicate albumin as a marker of the poor nutritional condition of the elderly. The adequate caloric level will spare protein for its specific biological / physiological functions. Optimal protein intake will restore optimal albumin levels, Hb levels, immunoglobulin levels etc, . Thus, diet plays a crucial role in restoring good / or satisfactory nutritional and health status, which has a direct bearing or quality of life. Hence, strategies need to be worked out to enhance the nutritional status of this vulnerable segment of the population i.e., the rural elderly in our country.

'Add life to years' and 'health for all by 2000', the slogans of the U.N., appear to be a far cry in the Indian scenario. If even a semblance of these UN objectives are to be achieved in India, mammoth efforts on a war footing need to be launched. Therefore, it is important that good nutrition is provided and disease conditions are prevented. The dietary guidelines should focus on such aspects as making the diet 'nutrient dense' and 'palatable', considering the lowered taste and smell perception and edentulousness of the aged. Decreasing total fat, sugar and salt; increasing micronutrients, fiber, antioxidants and optimal protein and calories are a few dietary guidelines that should be meticulously adhered to. Optimal nutrition would rejuvenate elderly, giving them vigour, vitality and a wish to

live longer, achieving 'livelier longevity'. The findings of the present study, therefore, are of practical relevance and of paramount importance in geriatric nutrition.

References

Bamji, M.S., Prahlada Rao, N. and Vinodini Reddy (1996). *Text book of Human Nutrition.* Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi.

Baumgartner R.N., Kochler, K.M., Linda, R. and Garry, P.J. (1996). 'Serum albumin is associated with skeletal muscle in elderly men and women. *A.J. Cli., Nut.* 64, 552-8.

Belbrauer, Ambroise, T., Nearkasen, C., Amani, T., Gerard, D. (1998). Serum protein status according to age and disease in hospitalised elderly. *Nut. Res.* 18, 10 : 1677 – 1689.

Bradley, J. and Xu, X. (1996). Diet, age and the immune system. *Nutrition reviews,* 54, S 43-50.

Campbell, W.W., Crim, M.C., Dallal, G.E., Young, V.R. and Evans, W.J. (1994). Increased protein requirements in elderly people : New data and retrospective reassessment, *A.J. Cli. Nut.* 60, 501-509.

Chan, G.M., Hoffman, K. and McMurry, M. (1995). Effects of dairy products on bone and body composition in pubertal girls. *J. pedi.* 126, 551-556.

Chandra, R.K. (1992). Effect of vitamin and trace element supplementation on immune responses and infection in elderly subjects. *Lancet,* 340, 1124-1127.

Cohen K.H., Conor, B.E.L. and Edelstein, S.L. (1992). Albumin levels as a predictor of mortality in the healthy elderly. *Jr. Cli. Epidemiol*: 45, 207-212.

Corti, M.C., Guralnik, J.M., Salive, M.E. and Sorkin, J.D. (1994). Serum albumin level and physical disability as predictors of mortality in older persons. *JAMA,* 272, 1036-1042.

Gariballa, S.E. and Sinclair, A.J. (1998). Nutrition, ageing and ill health. *Br. Jr. Nut.* 80, 7-23.

Gopalan, C., Ramasastri, B.V. and Balasubramanyam (1996). *Nutritive value of Indian foods.* National Institute of Nutrition, Hyderabad.

Kelman, L., Saunders, S.J., Frith, L., Wicht, and Corrigal, A. (1972). Effects of dietary protein restriction on albumin synthesis, albumin catabolism and the plasma aminogram. *A J. Cli. Nut.* 25, 1174-1178.

Kyaw, A. (1978). A simple calorimetric method for ascorbic acid determination in blood plasma. *Clin. Chim., Acta.* 86, 153-157.

Monsen and Balintfy (1982). In Normal and therapeutic Nutrition (Robinson, C.H. and Lawler, M.R. (1982), Mac Millan publishing Co., New York.

Munro, H.N., McGandy, R.B., Hartz, S.C., Russel, R.M., Jacob, R.A. and Otradovee, C.L. (1987). Protein nutriture of a group of freeliving elderly. *A. J. Cli. Nut.* 46, 586-592.

Murayama, N., Kovichi, H., Sugiyama, M., Hiroshi, A. and Masayuki, T. (1999). Salivary indicators of protein nutritional status in the elderly. *Nutr. Res.* 19, 7 : 979 to 988.

Ness, A.R., Khaw, K.T., Bingham, S. and Day N.E. (1996). Vitamin C status and respiratory function. *Eur. Jr., Cli. Nut.,* 50, 573-579.

Raghuramulu, N. (1993). Biochemical methods for assessment of nutritional status. *Proc. Nutr. Soc. India,* 40, 114.

Raghuramulu, N., Madhavan Nair, K. and Kalyana Sundaram (1983). *A manual of laboratory techniques,* NIN, Hyderabad, 37, 42 –184.

Rothschild, M.A., Oratz, M. and Schrieber, S.S. (1988). Serum Albumin. *Hematology, 1998,* 8; 385-410.

Salive, M.E., Corononi, H.J., Philips, C.L. (1992). Serum albumin in older persons : relationship with age and health status. *Jr. Clin. Epidemoil,* 45, 212-213.

Seltzer, M.H., Bashidas, J.A. and Cooper, D.M. (1979). Instant nutritional assessment. *Jr. Paren. Enter. Nutr.,* 3, 157-159.

Srilakshmi, B. (1993). *Dietetics.* New age international Pvt. Ltd. Publishers, Chop. 14, 0. 182-188.

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An Investigation of the Circumstances of Death which Predict Poor Coping in Older Bereaved Spouses

Kate Mary Bennett

ASTRACT

The aim of the study was to examine the circumstances prior to spousal loss which determined whether older people coped well or poorly with spousal bereavement. Ninety two older widowed people were interviewed about their experiences of bereavement and widowhood. Each widow was assessed as either coping or not with their widowhood. A variety of circumstances prior to the death were examined including expectations of death, interpersonal relationships, and the facts of the death. Surprisingly, only the circumstances of the death itself predicted coping, using loglinear analyses. Those who coped less well were more likely to have had a spouse who was unwell before their death but whose death was nevertheless unexpected. Those widowed people for whom their spouse's death was either expected or indeed unexpected coped better. The implications for widowhood preparation are discussed. In addition, the explanations for why other circumstances do not predict poor coping are discussed.

Keywords: Spousal Bereavement, Coping, Circumstances of Death

Widowhood in later life is a life event which affects many older adults. Many researchers have been interested in examining the

factors which influence the outcome following the death of a spouse for psychological wellbeing (see Stroebe and Schut, 2001 for a review). A number of factors have been examined including personal, interrelational and situational (Parkes & Weiss, 1983, Lopata, 1996, Stroebe, Stroebe & Dommitter, 1988). Several of the influential researchers in the field have discussed whether the circumstances of the death influence the outcome, that is whether a particular circumstance aids or hinders a positive outcome (Stroebe et al., 1988, Parkes, 1996).

In Parkes' seminal work he examines some of the determinants of grief including the circumstances of the death (1996). He found that unexpected deaths, violent deaths and deaths as a results of human agency (e.g. suicides) were more often associated with psychological distress than other types of circumstances, especially those which occurred in natural circumstances. Lopata (1996) also discusses the effects of sudden or violent deaths on the psychological wellbeing of the bereaved. She too found that these circumstances had a greater impact than those where the death was anticipated. Schaefer and Moos (2001) suggested that being forwarded of a death gave the bereaved an opportunity to prepare for the death and to enhance personal growth. Work reviewed by Stroebe and Schut (2001) suggests that the evidence is more mixed than our review has so far suggested. For example, they refer to work by Breckenridge, Gallagher, Thompson and Peterson (1986) who found that responses to a depression measure did not differ between those who loss was unexpected and those whose loss was not. More equivocally, Stroebe et al. (1988) found that expectedness was marginally significant only at first point of measurement, and only then in those people with external locus of control beliefs. These equivocal findings suggest that more investigation is needed.

Researchers have also examined other circumstances concerned with the circumstances of death such as the interpersonal relationships surrounding the deceased and the bereaved. For example, as Stroebe and Schut (2001) point out lack of social support is widely recognised as a risk factor for poor outcomes

following bereavement. Parkes and Weiss (1983) found that those widowed people who had an ambivalent relationship with the deceased were more likely to experience poorer outcomes than those who had enjoyed a rewarding relationship.

Much of the work reviewed here is drawn from studies of bereavement and not specifically from either studies of spousal bereavement nor from studies of older adults. The study presented here specifically examines here older bereaved spouses, 55 years of age or older at time of interview. In addition, all of the participants were bereaved in natural circumstances, that is no spouses died from violent or accidental causes. The circumstances of death were extracted from extended interviews and accounted for all events which occurred up to the point of death.

Method

Participants

The participants were 46 widowed men and 46 women aged between 55 and 95 years (mean = 74) living in the North West of England. They had been widowed between 3 months to 60 years (mean 9.5 years). Demographic details are summarised in Table 1.

Procedure

The aims of the Older Widow(er)s Project were communicated to a diverse range of formal and informal groups of older people. Contact was also made with other welfare organisations and agencies, social services and sheltered housing schemes, through whom links with widowed people were established. Interested individuals returned an ‘expression of interest’ form and were then sent further information and invited to talk about their experience of widowhood at interview. Two expressions of interest did not result in participation, and one male respondent completed the questionnaires only. The interviews were conducted by one of three interviewers and were tape-recorded, took place at the respondents’ homes, at a day centre or at the University of Liverpool and lasted between one and two hours. The study was approved by the local ethics

committee and confidentiality and anonymity were assured. Names have been changed to preserve anonymity.

Selection Issues

Studies of widowhood, especially those using interviews, present a number of methodological challenges concerning selection. First, this type of work is only possible, and indeed ethical, with volunteers. Second, there is a danger that those who volunteer are not representative of the widowed population as a whole. For instance, participants who volunteer for interview studies may be those who are more articulate or who may have a particular agenda of their own regarding widowhood. Third, the sample size for qualitative interview studies is usually smaller than for quantitative work, and as a consequence the claims made by such studies are different. Finally, widowed people do not represent a homogeneous social group. We considered these issues carefully and have addressed them as far as is possible. Addressing the first two issues together, we engaged in extensive out-reach work to ensure that we did not recruit only those widowed people who always participate. Indeed, virtually all of our participants had not taken part in research before, many were recruited by word of mouth, or encouraged to participate by friends or support networks. It is clear from our transcripts that many of our participants were not highly articulate or well educated. Participants came from a wide range of social and economic backgrounds, representing the diversity of Merseyside. Indeed, we carried out a comparison of socio-economic status of our participants with General Household Survey 2001 norms and found no significant differences (ONS 2001). We were able to recruit equal numbers of men and women, this was despite the general difficulties found by researchers in this field to recruit men. Unfortunately our sample did not reflect ethnic diversity. We had attempted to recruit from minority ethnic communities but were, on this occasion, unable to do so (this is an issue which we intend to address in further work). The heterogeneity of the sample is, we believe, a strength. The sample reflected all socio-economic statuses and was also diverse with respect to age and length of time widowed. This diversity has meant

that in work presented elsewhere, we have been able to examine factors such as age and length of bereavement and their influence on the experience of widowhood (Bennett, Hughes & Smith, 2002; Bennett, Hughes & Smith, in press).

The Interview

The interviews were semi-structured and were designed to elicit information on lifestyle and affect, by asking what the participants did and how they felt at specific times. Respondents were first asked factual information concerning age, length of marriage, widowhood and family relations. Secondly participants were essentially asked two questions (with supplementary questions) about their widowhood; what did you do; and how did you feel. These two questions were asked repeatedly following the chronology of events: married life prior to widowhood; the time around the death of the spouse; one year post-bereavement (for those who had been widowed for longer); and the present time. In addition, participants were asked their views on widowhood more generally – whether they thought widowhood was different for a man than for a woman; what advice they would give someone in the same situation as themselves; if anything would make life easier for them; and whether they thought the government or local authority could do anything to help widowed people.

Analysis

The interviews were coded using grounded theory and content analysis methods by three members of the team (see Bennett and Vidal-Hall, 2000, for a detailed description of the analytical technique). The codes which were examined in this paper concerned all those which reflected the circumstances prior to and including the death, but not post-death experiences. The circumstances can be considered under three headings: expectations about death; personal relationships; facts of the death. In the first of these we considered whether the death was expected or unexpected, but also whether the deceased had been ill but the was nevertheless unexpected. In respect

of personal relationships we considered such factors as family support, caring relationships, whether there had been an opportunity to say goodbye to the deceased, previous employments of deceased and bereaved. Finally, we considered both the place of death and the cause of death under the heading facts of death, we also looked specifically at whether the death was from cancer or not. Inter-rater reliability was assessed and agreement was found to be 80% between the coders.

As part of the larger study coping was assessed by expert reading of the interviews and assessment of non-verbal aspects of the interview. For example, coders looked for reports of medication, contact with primary care, not coping, and the non-verbal content of the interviews were taken into account. They were classified either as coping well or not coping well (coded 1 and 2 respectively), these are referred to as Coper or Non-Coper, respectively. This assessment was made independently by two members of the team (GMH and KMB) and agreement was found to be 95%.

Three-way loglinear analysis (Gender x Coping x Circumstance) were carried out on the interview data and significant results checked with Fisher's exact, in order to assess significant associations. A three-way interaction in this analysis would indicate that the circumstance of death was relatively more often associated with successful Coping for one gender rather than the other. On the other hand a two-way interaction between Gender and Circumstance would indicate a particular circumstance is associated with a particular gender. A two-way interaction between Coping and Circumstance would indicate a particular circumstance is associated with Coping.

Results

Whilst x Circumstance variables were considered only one of these demonstrated a significant loglinear interaction. There was a significant loglinear interaction between coping and the circumstance where the deceased had been ill but the death nevertheless

unexpected (c2 (1) =5.43, p = 0.02; Fisher's Exact p = 0.018). Those who were coping less well were more likely to have experienced a death where the spouse had been ill but where the death was nevertheless unexpected. There was no three-way interaction nor one involving gender. See Table 2 for the contingency table.

Table 1: Demographic Data by Gender

		Mean	Standard Deviation	Range
Women (n = 46)	Age	73.29	8.93	57-95
	Years Married	35.75	13.49	2-63
	Years Bereaved	10.94	10.7	1-60
	Children	2.28	1.72	0-10
	Grandchildren	3.65	2.98	0-11
	Great Grandchildren	0.61	1.39	0-5
Men (n = 46)*	Age	75.02	7.88	55-93
	Years Married	39.37	12.97	5-63
	Years Bereaved	8.18	6.72	0.25-25
	Children	2.57	1.47	0-6
	Grandchildren	3.93	3.35	0-13
	Great Grandchildren	0.67	1.7	0-8

* Sample n includes the participant who completed the questionnaires only

Table 2: Contingencies for Deceased Ill Yet Death Unexpected

		Coping		
		Yes	**No**	**Total**
Deceased ill yet	No/unreported	47	12	59
death unexpected	Yes	18	14	32
Total		65	26	91~

~ Sample n does not include the participant who completed the questionnaires only

Discussion

Only one of the circumstances which we examined significantly distinguished between those participants who were coping well and those who were coping less well. Those participants who coped less well were more likely to have had a partner who had been ill but whose death had not been expected, for the spouse at least. We will discuss this in more detail later. First however, a brief comment must be made about the non-significant findings. Eight circumstances not related to expectedness of death were examined which were shown to be non-significant factors. None of the variables concerning personal circumstance nor the facts of the death were significant. These results were unexpected, since previous research had suggested that they may be important factors in predicting coping outcome. Further research is needed to examine whether these findings robust and if they are what explanations are there.

With respect to the expectedness or otherwise of the death the findings are interesting and add new light to previous research. We have shown in our literature review that whilst some studies show evidence to support the view that unexpected deaths are more difficult to cope with, others do not. As Stroebe and Schut (2001) suggest the picture is more complex. In our analysis we introduced a third dimension to the expected/sudden conceptualisation, that of spouse ill but death unexpected. This dimension encompasses a number of circumstances which we identified in our interviews. First, there are those participants who have a spouse who is dying but where the bereaved is unaware of the fact. Second, the spouse may be dying but the spouse is in denial. Third, the spouse may be ill but dies of something else which is unexpected. This last circumstance is more common than one might expect. For example, there are participants whose spouses have a chronic illness such as dementia but who died of an unrelated condition such as coronary heart disease

One might argue that the accuracy of participants' information regarding the health status of their partners, and indeed the cause of death is not ideal. However, what we would argue, especially in the context of coping,, is that it is the beliefs which are held by the participants which are most influential in the coping outcome. In that sense, it is valid to group together in our analysis those who are in

denial and those who are unaware of the fact that their partner is dying.

Finally, what are the implications of this study with respect to caring for the soon to be bereaved spouses. There are both preventative and intervention strategies which could be valuable. For those widowed people where the death was unexpected to them, but not perhaps to the medical profession, family or other support networks, there is room for prevention strategies. More information and information which is designed for the soon-to-widows would be beneficial. In reading the interviews it is clear how many widowed people are ill-informed about their spouses condition. In some instances support for the spouses of the dying is required in order to better equip them for lives alone. For those widowed people where the spouse is ill but the death is truly unexpected before the bereavement, there are intervention strategies which could be utilised. Identifying those widows as at risk would be a valuable first step. They could then be offered appropriate support.

References

Bennett, K. M. Hughes, G. M. & Smith, P. T.: Bereavement and Gender Effects on Lifestyle and Participation. *Proceedings of the British Psychological Society*, 10: 54, 2002.

Bennett, K. M., Hughes, G. M. & Smith, P. T.: "I think a woman can take it": *Widowed men's views and experiences of gender differences in bereavement*. (In Press Ageing International).

Bennett, K. M., & Vidal-Hall, S.: Narratives of death: A qualitative study of widowhood in women in later life. *Ageing and Society*, 20: 413-428, 2000.

Breckenridge, J. N., Gallagher, D., Thompson, L. W., & Peterson, J.: Characteristics depressive symptoms of bereaved elders. *Journal of Gerontology*, 41:163-168, 1986.

Carr, D., House, J. S., Wortman, C., Nesse, R., & Kessler, R. C.: Psychological adjustment to sudden and anticipated spousal loss among older widowed persons. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences*, 56: S237-S248, 2001.

Lopata, H. Z.: *Current Widowhood: Myths and Realities*. London: Sage, 1996.

Parkes, C. M.: Bereavement: Studies of Grief in Later Life (3rd ed.). New York: Routledge, 1996.

Parkes, C. M., & Weiss, R. S.:*Recovery from Bereavement*. New York: Basic Books, 1983.

Schaefer, J. E., & Moos, R. H.: Bereavement experiences and personal growth. In M. S. Stroebe, R. O. Hansson, W. Stroebe & H. Schut (Eds.), *Handbook of Bereavement Research: Consequences, Coping and Care* (pp. 145-167). Washington, D. C.: American Psychological Association, 2001.

Stroebe, W., & Schut, H.: Risk factors in bereavement outcome: A methodological and empirical review. In M. S. Stroebe, R. O. Hansson, W. Stroebe & H. Schut (Eds.), *Handbook of Bereavement Research: Consequences, Coping and Care* (pp. 349-371). Washington, D. C.: American Psychological Association, 2001.

Stroebe, W., Stroebe, M. S., & Domittner, G.: Individual and situational differences in recovery from bereavement: A risk group identified. *Journal of Social Issues*, 44:143-158, 1988.

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Aging in Place : Possibilities and Problems

Indira Jai Prakash

ABSTRACT

Older people may prefer to continue to live in their own place rather than relocate to be with childrne. This living arrangement may not always be satisfactory. Ninety-one old men and women living alone in the community in Bangalore City were interviewed to understand their life circumstances. Widowhood rather then childlessness was the reason for living alone. For household management these people depended on servants and in case of medical emergencies they sough the support of neighbours and relatives. Loneliness and concerns about progressive health decline caused anxiety. They could not perceive any advantage in living alone but had adjusted to the reality. Whiel 'aging in place' is a good idea, in the absence of appropriate, affodalable community based longterm services for older people, it may prove to be a bad practice. Living alone may compromise the quality of life of older people due to absence of required services.

Key words : Loneliness, Living alone, Quality of life, Older people.

Very often, old people are found to be living alone due to a combinatin of circumstances. Many prefer to live by themselves than move to an old age home, even if that option exiss. Some resist relocating themselves in old age and prefer tolive in the house, neighbourhood and city they are familiar and comfortable with. It is

true that old people should be encouraged to live independently in the community. Such 'aging in place' has several advantages. Emigrating or institutionalization may not be always the proper solutions to old people living by themselves. In India, contrary to popular belief of family care of older persons, many senior citizens are found to be living alone. Household composition is undergoing significant change leading to alteration in living arrangements of family members. There are several reasons for old people living by theselves (Rajan Mishra and Sharma, 1996). The single most common reason for living alone in old age appears to be widowhood (Prakash, 2003). For a person living alone, as sickness and level of disability increase, receiving appropriate, timely and long-term care becomes difficult. Metropolitan cities, if news reports are accurate, are registering a growth in single person households. Even empirical studies, though on small samples, indicate a rise in the percentage of elderly living alone. Living arrangments have been found to influence a range of variables that directly or indirectly impact well being of the elderly. A study was undertaken in Bangalore city to identify the reasons for older people living alone and the quality of their life.

From Bangalore city a sample of 41 men and 50 women who were living alone which contacted for this study. This sample was purposive. To recruit subjects, several social organizations and clubs were approached. People were asked to refer any one living alone to the researcher. Over a six month period, a small number could ber identified, who were willing to be interviewed. Since the focus was on people living in the community, hospitalized elderly, people in geriatric care services were omitted. Finally interviews could be conducted with only 91 people. They were interviewed with the help of an interview schedule and major findings are reported below.

A. Sample characteristics : As mentioned earlier, this was a purposive sample. Details of the sample are given in table-1.

Table 1

Sample charateristics

	M	F
N	41	50
Mean Age	71.25	68.3
S.D. Age	5.36	4.96
Single	5	7
Widowed	36	43

Majority of the subjects were in the 60-70 age group. There were four men and two women who were above 80 years of age and living by themselves. As is common in most older groups, the number of people widowed were high. Both marriage and widowhood appear to be almost 'normative' in our culture. Only about 13% of the sample was in the single group. Incidently, of the 12 single people one woman was deserted after marriage. Most of the married people had at least one child. More details are given in table-2.

Table 2

Number of children (N-79)

	M (N=36)	F (N=43)
Nil	6	6
1-3	14	21
4-7	14	14
8-10	2	2

It is interesting that childlessness is not the most common cause of living alone. Many people in this study had four to five living children and yet were alone.

B. Socio Economic condition : Older people had different source of income. Most of them mentioned pension or savings as the source of income. In some cases children sent remittance periodically to support their older parents. Table 3 gives the number and percentage of people having different sources of income.

Table 3

Source of Income

	M	F
Savings	31 (75.6)	27 (54)
Pension	26 (63.4)	34 (68)
Children	8 (19.5)	10 (20)
Rent	17 (41.5)	13 (26)
Other	4 (10)	5 (10)

Three men and two women were still working as domestic workers and coolies to earn their livelihood. Two women were receiving old age pension. Only nine women had worked in earlier years. While all the men had been employed in same way or the other. Most women still received the pension of their spouse.

C. Health and problems in daily living : Considering the age of the subject (Mean around 70 years), they could be described as in fairly good health. More then 68% of the subject rated their health as 'OK' to very good. Self rated health ratings are shown in table-4.

Table 4

Self rated health of subjects (n)

	M	F
Very poor	5	–
Poor	9	15
OK	23	16
Good	13	9
Very good	–	1
Total	**50**	**41**

It is worth noticing that five women rate their health as very poor while none of the men do so. Four men had undergone bypass surgery, four had surgery for hernia and two for cataract. Five women had undergone bypass surgery, three had hysterectomy, one had mastectomy. One woman had multiple surgeries for various medical reasons. A major complaint from women was that of pain in the joints, difficulty in walking and bending, and rheumatic pain (60%). Hypertension was reported by 54% of men and 28% of women. 50% of men and 16% women reported that they were

diabetic. NEarly 41% had problems with vision, while problem with hearing was relatively less (8%).

Though multiple health problems were present, none had difficulty in excuting activities of daily living. Majority (60%) depended on negihbours and serants (57%) for help during sickness and any medical emergency. Only 17.6% said they depended on neighbours and servants (57%) for help during sickness and any medical emergency. Only 17.6% said they depended on children or other family members (12%) for help during ill health. Neighbours and servants helped these people by calling up the doctor, bringing medicine, informing children and supplying food. When they had to decide on certain other issues, they would consult friends and neighbours and relatives but not servents. Majority (75%) was quite satisfied with the support they receive from others.

D. Reasons for living alone : It was clear that inspite of having children and often children in the same city, many were living on their own. The single major reason was that the spouse was dead and children were away. Five percent did not or could not live with children who were settled aboard. 45% said since the children were away in different part of the country or city, they had to live alone. 11% said they had poor adjustment or misunderstanding with children or daughter in law. So they opted to live alone. Having only married daughters, not having children, spiritual reason were the other factors. Old couple living by themselves were forced into loneliness when the spouse died.

The period for which these people were living alone ranged all the way from 55 years (in case of two single men and women) to 5 years. Majority (34%) had been living alone for 6-10 years followed by 11-15 year (25%). Single people had been living alone after the death of their parents. Some had lived with sibling till they (siblings) moved away or died. People whose children were abroad, or married and living separately were forced to live alone after death of the spouse. Loneliness was the major problems faced by these people and it was a major source of anxiety. Not having a helper or some one to run the house bothered men more than the women. Problem with servants, not able to manage the house hold chores on their own were also source of anxiety. Concern about health and anxiety that one may not be able to cope with failing health was expressed by

32%. Concerns about personal safety, theft and attack were not very often expressed. They could not think of any advantage in living alone. Only 8% said it was better this way. Most acknowledge the fact that living alone gives them freedom to do what they; what when they want and the time is their won. But most ask the question "what are we to do with this free time ? What is the use ? Where can we go ? How can we use this time and freedom ?" Feeling isolated, worries about health, sense of being left alone bothered many. They have adjusted to the life style and structure their time around household chores and self care. Most say there is no advnatage or joy in living alone. Given a choice, they would like to be with their family. Sicne it is not possible, they have adjusted to the situation. This is reflected in their evaluation of the best and worst years of their life. Most report younger, student days, working life and the years when family was together as the best years. More women report married life and when children were younger as the best years of the life. Most men rate the present as worst. Women say the period after the death the spouse as the worst years of their life.

Discussion

Living alone in old age seems to be becoming increasingly common in Indian cities. Traditionally old people in India lived in extended or joint families. Marital status makes a difference to living arrangement in old age while having children has no impact (Mishra, 2003). In this sample, even while having 4-5 living children, people were forced to live alone. Childlessness per se does not significantly increase the prevalence of loneliness and dependence in advanced ages. Loneliness is considered to be a net of several other factors (Zang & Hayward, 2000). In this study also there was no difference in the loneliness expressed by people with and without children. (X^2 = 0.0045, Not significant)

Fortunately, in this sample, most rate their health as average inspite of having some diagnosed disorder. The worrying question is what happens to them five or ten years from now, when they enter the 'old-old' category. Self rated health is often considered to be a very good predictor for future health status, and mortality even when controlled for demographic characters (Menec & Chpperfield, 2001; Svedberg & Lichtenstein, 2001). It is quite possible that these people are still living in the community and not in old age homes because of

their functional competence. Yet, sensory difficulties in the subjects are likely to reduce their quality of life. A study using multivariate analysis reports that poor vision is independently associated with lower levels of psychological well being (Bazargan and Baker, 2001).

Studies report that living alone is due to a complex pattern of several interrelated factors. And, it is presumptive to say that elderly are happier when living with children (Kamwals and Lee, 2003). However, many Indian studies suggest that Indian elderly are socialized to expect family support in old age. As such, their life satisfaction in old age is closely linked to family living. (Cherain, 2003; Dave and John 2003). People make adjustment to life circumstances and do manage to live alone. Even women, who in traditional India are expected to be under the care of a male member, are living alone. This, however, raises several questions regarding quality of life.

Are old age homes an answer to this problem of people living alone ? Old age homes are neither economically viable, nor culturally acceptable to most Indians. Millican (2003) comments that 'Aging is place', the ability to receive services in the same setting as a person's needs change has become the 'Mantra' of consumers, advocates and policy makers. They recommend expanding community based long-term care services. It is assumed that people may not wish to move from their homes to nursing homes as they become old or sick. To remain at home, people need a host of services. At present the situation in India is old people still live at home, in the community but without access to a range of services they may need. As people grow older, they may need more intense health care, help with chores and even daily activities. Right now there is no provision for promoting affordable and reliable services to older people. Absence of family support combined with absence of community based services will reduce the quality of life of senior citizens. Old people living alone should be treated as a special group by NGOs and CBOs. It is essential to sensitize community to involve itself in long term care of older people living alone. Aging in place may be a good idea but bad practice if appropriate support system does not exist in the society.

Reference

Bazarang, M., Baker, R.H. and Bazarang S.H. Sensory impairment and subjective well being among aged African - American Persons. *Journal of Gerontology. Psychological Sciences*, 56B, pp. 268-278, 2001.

Cherian, J. Adjustment of the elderly in relation to living arrangement, gender and family life satisfaction. *Indian Journal of Gerontology*, 17(1-2) p. 99-108, 2003.

Dave, P and John, G. A look into the lives of older persons. *Indian Journal of Gerontology*. 17(1-2) pp. 109-116.

Kam-wah, C. and Lee J. (2003). Autonomy or Dependence ? Housing and living arrangments of the elderly in Hong Kong. *Indian Journal of Gerontology*, 17(1-12) pp. 59-76, 2003.

Menec, V.H. and Chipperfield, J.G. A Prospective analysis of the relation between self-rated health and health care use among elderly Canadians. *Canadian Journal of Aging*. 20 (3) pp. 293-3062, 2001.

Millican, R. Coordinating services across the continuum of health, housing and supportive services. *Journal of Aging and Health*. 15(4) pp. 165-188, 2003.

Mishra, A.J. (20030. A study of loneliness in an old age home in India: A case of Kanpur, *Indian Journal of Gerontology*. 17(1-2) pp. 136-146, 2003.

Rajan, I., Mishra, U.S. and Sharma, P.S. *Living arrangements among Indian Elderly*. An analysis from the National Aging Survey. pp 282-287, 1996

Svedberg, P., Lichtenstein, P. and Peders, N.L. Age and six difference in genetic and environmental factors for self rated health : A twin study. Journal of Gerontology. *Social Sciences*, 56B, pp. S171--S178, 2001.

Prakash, I.J. (Ed.). *Aging : Emerging Issues*. Bangalore; Bangalore University, 2003.

Zang, Z. and Hayward, M.D. Childlessness and the psychological well being of older persons. *Journal of Gerontology, Social Sciences*. 56(B) S311-S330, 2000.

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Quality of Life of Religious Older People : Effect of Productive Engagement in Activities and Gender

Madhu Jain and Anamika Sharma

ABSTRACT

Human beings have an innate urge towards personal growth, to evolve through deeper self-knowledge and to feel that they are valuable elements within the grand scheme of things. The current research envisages the impact that productive engagement in work, with high religiosity in old age, can cast upon the quality of life of older people. The findings of the research discussing the productive engagement in work, gender and quality of life in combination with the resurgence of religiosity in old age, brings one to the conclusion that religiosity as well as productive engagement in work does play a pivotal role in individual's daily life.

Keyword : Religiosity, Productive engagement in work, gender, Quality of life.

We have reached a significant crossroads, the closing of one millennium and the beginning of another. This is a momentous occasion by all accounts. Yet what is remarkable is that what awaits the world in this new era as it undergoes a demographic revolution. The world is changing as it ages, and just as older persons have been agents of that change, they must also be its beneficiaries.

Behavioral scientists are showing interest in exploring how a sense of spirituality and religiosity contributes to an experience of late life well-being that is not tied to the typical objective indicators of health, financial security, and social support. Through their

discovery and utilization of spiritual resources, older persons may experience their lives as meaningful even in the face of multiple, serious challenges to satisfaction with life (*Wong, 1989).* Religion, therefore, may be acting as a buffer against social and financial deprivations and more studies are needed controlling for these confounding variabvles (*Conway, 1985; Koenig et al, 1988).* It is this aspect of well being-meaning-that has largely been missing from the research on aging well.

Moreover, successful aging has been described as the maximization of the benefits associated with aging and the minimization of the losses (*Baltes & Baltes, 1990).* One criterion for aging successfully is the maintenance of good health and well-being late into the life span. One pathway to enhacned health and well-being is through involvement in productive activities *(*Herzog, Franks, Markus, and Holmsberg, 2002). Productive activities are those that produce goods or services, whether paid for or not (Caro and Bass, 1995). Activities included in this definition are volunteering, working, and care giving (Morrow-Howell et al, 2001). Recent research also has demonstrated a link between productive activity and health and well-being (Krause, Herzog & Baker, 1992; Garfein & Herzog, 1995; Glass et al., 1995). Similarly, it is our contention that productive activities exert an impact on well-being because they are involved in fashioning and maintaining an agentic (e.g., competent, active) identity or self in later life.

Thus, gerontologists have promoted a new perspective on later life in an era wherein changing demographic patterns are set to transform social relations amongst all age groups (Katz, 1999). One of the important and resounding themes of countries with Healthy Aging initiatives is the viewing of aging as a positive process full of opportunities and needs. The focus is to improve the quality of life rather than curing and preventing diseases (Report on Healthy Ageing, April 2001).

Quality of Life (QOL) is again a term heard frequently these days, particularly when issues of health, ageing and economics are being discussed. The definition and measurement of quality of life has been comprehensively developed by *Cummins (1997 a)* - **"Quality of life** is both objective and subjective, each axis being the aggregate of seven domains : material well-being, health,

productivity, intimacy, safety, community and emotional well-being. Objective domains comprise culturally relevant measures of objective well-being. Subjective domains comprise domain satisfaction weighted by their importance to the individual."

With subjective quality of life established as a valid and useful social indicator, it then becomes important to better understand this measure by considering the psychological processes that contribute to an individual's satisfaction with different areas of their life. Moreover, little empirical evidence is available revealing whether productive engagement in work of religious older people makes a unique contribution to their quality of life.

The objectives, thus, found to be substantial with regard to the present study was to see the effect of productive engagement in work and gender on the quality of life of religious older people.

Method

Sample

The subjects for the current research constitutes of 100 older people of 60-75 years of age drawn from the city of Jaipur from different setups, of middle class socio-economic status. As far as the level of education is concerned, the subjects included in the study had at least the basic education to read and write, i.e., only the literates were included in this study. A preliminary study was carried out to find out the extent of religiosity in old age. Only older people having a high religiosity score on L.I. Bhushan's Religiosity Scale were included in the study.

The older people were classified into groups on the basis of productive engagement and non-engagement in work and gender. Out of 100 subjects, 50 productively engaged and 50 non-engaged older people were taken up. Sample was further subdivided in terms of gender - male and female. 50 males and 50 females were included in the study.

To study the effect of productive engagement in work and gender on the quality of life of older people, the multivariate factorial design was used.

Tools

1. **Religiosity Scale** : The religiosity scale developed by L.I. Bhushan (1990), incorporating 36 items in simple Hindi intends to study the various dimensions of religious behaviour. R-scale is a five point Likert type scale. Subject's religiosity score is the algebraic sum of scores obtained by him on all the different items.
2. **Measure for assessing Productive Engagement in Work** : The variable "productive engagement in work" has been included in the study for dividing the sample into two groups : engaged and non-engaged. The criterion for productive engagement in work as set up by the researcher is at least 18-20 hours per week. The engagement in activities has been assessed by asking the subjects about their involvement in various activities, like paid job, volunteer work, social service, religious activities, etc. and the no. of hours devoted to that activity.
3. **Comprehensive Quality of Life Scale - Adult** : The test is designed by Roberts A. Cummins (1997) incorporates a contemporary understanding of the QOL (quality of life) construct. It defines life quality in terms of seven domains which together are intended to be inclusive of all QOL components : material well-being, health, productivity, intimacy, safety, place in community, and emotional well-being (Cummins, 1996, 1997a). Each domain is separately rated in terms of its importance to the individual as well as on its perceived satisfaction. A detailed scoring procedure for each domain has been provided with interpretation.

Procedure

As the subjects under study consisted of the people of 60 years of age and above, it was not possible to contact them in a formal setting. So, the subjects were contacted in person in various types of setup - homes, offices, workouts, and community service centers of the city of Jaipur in Rajasthan. A preliminary study was conducted to find out the extent of religiosity in older people and to extract the religious older people. The subjects were contacted individually. After the data collection was complete, the scoring of the scales was done following the instructions given in the related manuals for the scales.

The data, thus, derived was put to analysis using the suitable statistical techniques.

Results and Discussion

2 × 2 ANOVA was computed to test the independent and joint effect of productive engagement in work and gender in later life on quality of life and its domains (material well-being, health, productivity, intimacy, safety, place in community, emotional well-being, importance, and satisfaction). Table 1 provides mean and standard deviations of the scores on seven domains of objective quality of life and total objective quality of life and table 2 is related to analysis of variance for seven domains of objective quality of life and total objective quality of life. Table 3 deals with the mean scores and standard deviation of importance and satisfaction domain of subjective quality of life and the total subjective quality of life, and table 4 presents the results of ANOVA.

Table 1 : Mean and SD values for domains of objective quality of life with productive engagement in activities and non-engagement in old age and gender variables.

		Productive Engagement		Non-engagement	
Variables		**Males**	**Females**	**Males**	**Females**
Material Well-being	M	10.68	9.64	10.24	9.48
	SD	3.66	2.87	3.608	2.18
	Health	M	8.56	8.08	5.36
	5.36		SD	2.02	2.43
	1.89	1.93	Productivity	M	10.92
	9.48	6.56	5.32		
	SD	1.469	2.06	1.73	1.62
Intimacy	M	9.44	9.52	6.92	6.64
	SD	1.35	1.15	1.80	1.66
Safety	M	7.88	6.72	5.52	5.00
	SD	1.33	1.77	1.47	1.58
Place in Community	M	10.20	7.92	5.72	5.24
	SD	1.75	1.96	1.51	1.69
Emotional Well-being	M	10.16	8.80	7.00	5.84
	SD	2.03	2.34	2.06	1.77
Total objective QOL	M	69.04	62.00	46.28	41.52

	SD	4.98	6.74	4.63	4.99

Table 2 : Summary of Analysis of Variance for Domains of Objective Quality of Life and total Objective Quality of Life

Variable	F Ratio A	B	AB
Material Well-being	88.72**	3.25	.219
Health	50.606**	.333	.333
Productivity	150.85	14.87**	
Intimacy	85.25**	.91	1.46
Safety	43.44**	7.36**	1.069
Place in Community	106.27**	15.79**	6.72**
Emotional Well-being	54.98**	9.32**	.059
Total Objective QOL	400.33**	29.81**	1.13

* p<.05

** p<.01

A = Productive Engagement in work; B = Gender

Table 3 : Mean and SD values for importance and satisfaction domains of subjective quality of life with productive engagement in work and non-engagement in old age and gender

		Productive Engagement		Non-engagement	
Variables		Males	Females	Males	Females
Importance	M	26.16	16.48	18.44	11.96
	SD	3.04	3.39	3.12	3.72
Satisfaction	M	33.24	37.52	25.04	17.16
	SD	4.79	5.95	4.17	4.42
Total subjective QOL	M	59.40	44.00	4..48	29.12
	SD	5.92	6.16	5.51	6.18

Table 4 : Summary of Analysis of Variance for Domains of Subjective Quality of Life and total Subjective Quality of Life

	F Ratio		
Variable	**A**	**B**	**AB**
Importance	84.426**	147.16**	5.77**
Satisfaction	90.369**	48.52**	1.22
Total Subjective QOL	167.66**	156.53**	.19

* p<.05, ** p<.01
A = Productive Engagement in work; B = Gender

Tables 1 and 2 reveal that the productively engaged significantly differ on material well-being, health, productivity, intimacy, safety, place in community, emotional well-being domain of Objective Quality of Life and total Objective Quality of Life from the non-engaged religious older people. The result tables also depict a significant difference in productivity, safety, place in community, emotional well-being and total objective quality of life of male and female older people. Though the productive engagement in work and gender has been found to be jointly significantly affecting the mean scores of the different groups of older people (p<.01) only on the place in community domain. However, interaction effect of productive engagement in work and gender on the other domains is insignificant.

The findings of the research depicts that productive engagement and non-engagement in work significantly affect the material well-being (p<.01) of religiously older people, but gender does not make any difference to it. In Indian setup, the material well-being of women is dependent mostly on that of their husbands. So, independently and interactively gender would not make much difference. Health is significantly affected (p<.01) by the productive engagement in work of the religious older people, with no significant difference due to gender. This finding is in consonance with the study by *Moen,* Dempster-McClain and Williams (1992), Koenig, (1994), who documented that participation in produtive work is positively related to health.

The study reveals a greater influence of gender and engagement in work on the level of productivity in old age. For increased productivity in life, the key element is the continued involvement in productive activities (http:/www.lu.edu.hk/apias/ageing/htmk/KI/retirecontent.htm). In case of intimacy in old age, as has been depicted in Freud's sayings in two syllables - love, work, it appears that for active engagement with one's life, one need to have close personal relationship with family and friends, especially in later part of our lives. This interpretation goes in line with the research findings. Older people who keep themselves engaged in work are likely to better social relationships in turn leading to a better quality of life. Religious participation is positively associated with both the quantity and the quality of social relationships (Ellison & George, 1994). Engagement in work, irrespective of gender also has a decisive influence on the sense of safety in older people. Religious beliefs of older people also seem to be producing an impact on the perception of safety.

The human social system is such that a person is given respect and position in society for his contributions and help to the community. So, it is very much clear that older people who are actively engaged in some or the other works are likely to hold a better position in the communal settings. Older people are always looked towards for seeking advice and help.

Recent researches demonstrating a link between productive activities and well-being by Krause, Herzog, and Baker (1992), Garfein and Herzog (1995), Glass et al (1995) support the findings on emotional well-being domain. Similarly, it is the researcher's contention that productive activities exert an impact on well-being because they are involved in fashioning and maintaining an agentic (competent, active) identity or self in later life (Herzog, Franks, Markus, and HOlmsberg, 2002).

Tables 3 and 4 depict that productively engaged differ significantly from the non-engaged in perception of importance that the various domains of quality of life hold for them ($X = 21.32$ Vs 15.30, $p<.01$). Male and female older people also significantly differ in placing importance to factors affecting their quality of life ($p<.01$). Here, the interaction effect has also been found significant at .01 level.

A significant mean difference has been obtained in case of productively engaged and non-engaged older people on the satisfaction domain and total subjective quality of life. Further, gender also significantly affects the satisfaction on the domains determining quality of life and total subjective quality of life. However, interaction of the two variables is insignificant.

It becomes very much clear that the extent to which a person feels satisfied on the various factors governing the better and improved quality of life depends to a greater extent upon one's active engagement with one's life. If a person remains actively engaged with various activities, it not only adds to a better materialistic front, but also contributes to enhanced psychological and emotional well-being, in turn a better quality of life. A significant difference in total subjective quality of life of older people due to productive engagement in work and gender further strengthens the importance of engagement in work with variation due to gender in determining the quality of life. Freedman (1994) reviews the evidence of the psychological and social benefits associated with participation in service programs, including Senior Companions and Foster Grandparents, which show positive effects of participation on mental health and life satisfaction.

In support of the hypothesis that productive engagement in work and gender would affect the quality of life of the older people is a survey by P.D.H. Research Associates (1999) documenting that the majority of older people's quality of life and satisfaction with quality of life is driven by needs to feel active and vital, to maintain human connections, and to feel valued and needed.

Research on successful aging has led even Rowe and Kahn (1998) to assert the importance of productive engagement in work to continued health and subjective well-being suggesting that older adults want some balance of leisure and meaningful involvement that contributes to the welfare of others.

Successful aging is measured with indicatos of subjecive well-being such as life satisfaction, happiness, morale, contentment, perceived quality of life or other related measures of negativity such as depression, anxiety, etc. New efforts in the measurement of quality of life (Guyatt and Cook, 1994) and personal goals (Bearon

et al., 1994), and innovative qualitative studies on older adult perceptions of life satisfaction and successful aging (Fisher, 1992) suggest that there may be new and fruitful avenues for capturing and comparing individualized outcomes and developing a more variegated view of successful aging.

IMPLICATIONS

The importance of aging has been forgotten or perhaps hidden away by the focus on youth, as if it holds no significance. Yet old age is not a sedentary time or a time of idleness for the mind or the spirit. If done well, it might be possibly the biggest time for self growth.

Many older people derive a sense of meaning in their life through their sense of connectedness to their homes, their neighbourhoods, and the natural environment. So, an understanding of the dimensions of religiosity in old age can lead to a more complete portrait of the dynamics of the aging as well.

References

Baltes, P.B. & Baltes, M.M. Psychological perspectives on successful aging : A model of selective optimization with compensation. In P.B. Baltes & M.M. Baltes (Eds.), *Successful aging : Perspectives from the behavioral sciences* (pp. 1-34). New York: Cambridge University Press, 1990.

Bearon, L.B., Crowley, G.M., Chandler, J., Studenski, S., & Robbins, M. Personal functional goals : A new approach to assessing patient-relevant outcomes. Paper presented at the Annual Scientific Meeting of the Gerontological Society of America, Atlanta, Georgia, 1994.

Bhushan, L.I. *Manual for Religiosity Scale.* Agra : National Psychological Corporation, 1990.

Caro, F., and Bass, S. (1995). Dimensions of productive engagement. In S. Bass (Ed), *Older and Active* (pp. 204-216). New Haven : Yale University Press, 1995.

Conway, K. Coping with the Stress of Medical Problems Among Black and White Elderly. *International Journal of Aging and Human Development,* 21, 3, 1985.

Cummins, R.A. The domain of life satisfaction : An attempt to order chaos. *Social Indicators Research,* 38, 303-332, 1996

Cummins, R.A. Manual for Comprehensive Quality of Life Scale - Adult. Melbourne : Deakin University, 1997

Cummins, R.A. Assessing quality of life. In R.J. Brown (Ed.) *Assessing Quality of Life For People With Psychiatric Disabilities* (pp. 116-150). Cheltenham, England : Stanley Thornes, 1997a.

Ellison, C.G., & George, L.K. Religious involvement, social ties and social support in a southeastern community. *Journal for the Scientific Study of Religion,* 33, 46-61, 1994.

Fisher, B.J. Successful aging and life satisfaction : A pilot study for conceptual clarification. *Journal of Aging Studies.* 6 (2), 191-202, 1992.

Freedom, M. Seniors in national and community service : A report prepared for the Commonwealth Fund's Americans Over 55 At Work Program. Philadelphia : Public/Private Ventures, 1992.

Garfein, A.J. & Herzog, A.R. Robust aging among the young-old, old-old, and oldest-old. *Journal of Gerontology : Social Sciences,* 50B, S77-S87, 1995

Glass, T.A., Seeman, T.E., Herzog, A.R., Kahn, R. & Berkman, L.F. Change in productive activity in late adulthood : MacArthur studies of successful aging. *Journal of Gerontology : Social Sciences,* 50B, S65-S76, 1995.

Guyatt, G.H., & Cook, D.J. Health status, quality of life and the individal. *Journal of the American Medical Association.* 272 (8), 630-631, 1994.

Herzog, A.R., Franks, M.M., Markus, H.R., and Holmberg, D. *Productive Activities and Agency in Old Age.* University of Michigan's Survey Research Center, 2002

Katz, S. Old Age as Lifestyle in An Active Society. *Occasional Papers of the Doreen B. Townsend Center for the Humanities,* 19, 1999.

Koenig, H.G. Religion and death anxiety in later life. *The Hospice Journal,* 4 (1), 3-24, 1988.

Koenig, H.G. Aging and God : Spiritual pathways to mental health in midlife and later years. New York : Haworth Press, 1994.

Krause, N., Herzog, A.R. & Baker, E. Providing support to others and well-being in later life. *Journal of Gerontology : Psychological Sciences,* 47, 300-311, 1992.

Moen, P., Dempster-McClain, D., Williams, R. Successful aging : A life-course perspective on women's multiple roles and health. *American Journal of Sociology,* 97 (6), 1612-1638, 1992.

Morrow-Howell, N., Sherraden, M., Hinterlong, J., and Rozario, P. The productive engagement of older adults : Impact on later life well-being. *Final Report to the Longer Life Foundation,* 2001.

Peter D. Hart Research Associates. *The changing face of retirement : Older Americans, civic engagement, and the longevity revolution.* Washington, D.C. : Author, 1999.

Rowe, J.., & Kahn, R.L. *Successful Aging.* New York : Pantheon Books, 1998.

Wong, P.T.P. Personal meaning and successful aging. *Canadian Psychology,* 30, 516-525, 1989.

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Socio-Economic Transition and its Impact on the Elderly in Bangladesh : Issues, Challenges and some Policy Implications

Md Abul Hossen

ABSTRACT

Like other developing countries, Bangladesh's society, structure and values are in transition. Because of rapid urbanisation, westernisation, and globalisation the country's social economic and demographic scenario is changing rapidly. With the development of health care services and educational attainment, people are now more conscious and foresighted about their future. Decreasing birth rate the erosion of dominant religious and social values also contributes to expedite the transition process. Women's participation in the paid labor force outside of the house makes them more vocal in household decision making than ever before. Because of the socio-economic reality, the nuclear family is growing instead of the previously dominant extended family. All these changes have adversely affected the elderly's livelihood and support in Bangladesh. Unfortunately society is still less aware of the problem arising out of this transition. Given the rapid social and economic transitions in Bangladesh, it seems important to investigate the implications.

The aim of this paper is to document the changing trend of the society and to assess the impact of these changes on the existing social systems and traditional institutions (like extended family, respect to the elderly, elder son's responsibility to take care of parents so on) and to see how these changes are affect the day to day livelihood of the

elderly people in Bangladesh. The paper presents the situation of the elderly and on this basis discusses some recommendations to improve the future consequences.

Key words : Urbalization, Health care services Womens, Participation, Elderly people.

A global demographic revolution, signalling unprecedented transition from a state of high birth and death rates to one characterized by low rates of fertility and mortality, has taken place over the twentieth century. Starting in Europe and North America at the end of the last century, this demographic shift has now become a worldwide phenomenon. At the heart of the transition has been the growth in the numbers and proportion of older people (1).

In 1950 there were about 200 million people over sixty years of age throughout the world. By 2025 there will be 1.2 billion, representating nearly 15 per cent of the world's population. By 2050 older people will represent over 20 per cent of the world's population, and by 2150 nearly one person in three will be over 60(2).

As a consequence of the rapid decline in the fertility and the mortality rate in recent years, the dramatic rise in the number and proportion of the elderly population had been drawing worldwide attention. This massive potential for aging exerts influence not only on the economy but also on the family and community. As a result, policy to prepare for this aging surfaces as an urgent issue not only in developed countries but also in developing areas.

With a population of approximately 137 million (United Nations 2000) in a geographical area of 147,570 sq. km. (Bangladesh Bureau of Statistics 1995), Bangladesh has one of the highest population densities (931 people per square kilometer) in the world (World Bank, 2000). A decrease in fertility rates and an improvement in the average life expectancy has led to rapid increases in the number of older people in Bangladesh, with 80,000 new elderly added to the over 60 age group each year (3). Today, people 60 years and older make up 6% of the population of Bangladesh. While this percentage is small relative to developed countries, due to the large size of the population, it represents approximately 7.3 million people (Samad and Abedin 1998).

Furthermore, projections indicate that the number of older people will increase by 173% by 2025 (4). The majority of older people in Bangladesh belong to the 60-69 age cohort (young old) in both rural and urban areas (Samad, A. 1998) (Table 1 & 2).

Table 1
Elderly population in Bangladesh 1911-1991 (in thousand)

Year	Total population			Elderly population 60+			%		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1911	16106	15419	31525	704	671	1375	4.37	4.35	4.36
1921	17017	16183	33258	689	654	1343	4.04	4.04	4.04
1931	18303	17281	35584	653	491	1144	3.57	2.84	3.21
1941	21754	20240	41997	807	741	1548	3.71	3.66	3.69
1951	21938	19995	41933	1026	836	1862	4.68	4.18	4.43
1961	26349	24491	40840	1462	1193	2655	5.55	4.87	5.22
1971	37072	34407	71479	2292	1765	40557	6.18	5.13	5.68
1981	44919	42201	87020	2751	2153	4904	6.12	5.10	5.63
1991	57314	54141	111455	3298	2748	6046	5.75	4.17	5.42

Table 2
Population Projection of Bangladesh (1975-2025)

Year	Total population			Elderly population 60+			%		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1995	60745	57576	118321	3068	3150	6218	5.05	4.47	5.26
2000	65608	62301	127909	3544	3703	7247	5.40	4.95	5.67
2010	75551	72012	147563	4901	5232	10133	6.49	6.81	6.87
2020	85576	81179	166755	6998	7452	14450	8.18	9.18	8.68
2025	90406	83337	177776	8562	9059	17621	9.47	10.37	10.09

Source : Population Projection of Bangladesh (1975-2025) By G. Rabbani and S. Hossain, Bangladesh Bureu of Statistics, 1981, pp. 38-45.

One implication of the expected increase in the number of older people is a higher dependency ratio. As young wage earners become a smaller proportion of the population they will have to take a greater share of responsibility for a growing proportion of older people. The old age dependency ratio (person 60 years and over divided by person 15-59 years) is projected to increase from 8.0% in 1995 to

16.2 in 2025 (Kabir, 1994). Country-wide, poverty is exacrebated by problems of landlessness, unemployment, low education, high population growth, unequal land distribution, and yearly natural disasters such as floods, cyclones and drought that displace large numbers of people. These problems hit older people especially hard, as they are already in a vulnerable position due to their age. (Donoghue, 1999).

Traditionally, the most fundamental social unit in which older persons belong is the family. In providing all sorts of support to the elderly, family members play a vital role in society (Martins, 1990, Cain 1991). With economic development, family roles and functions are shrinking. Traditional support systems for older people in Bangladesh are based on joint family structure and kinship to ensure older people's care security and respect but this has been declining (Chaudhury, 1982; Perera, 1987; Mizan, 1994).

With the rapid decline of the joint and extended family system, the community no longer protects older people's rights as in the past. As a result, older people have largely been displaced in the community and are vulnerable to isolation, deteriorating health and poor living conditions. (Amin, 1996, Kabir and Salam 2001).

As the proportion of the Bangladeshi's population in the older age groups continues to increase, the need for improved information and analyses of demographics of elderly people increases. With the rapid socioeconomic and demographic changes taking place within the society, the current characteristics and experience of the elderly are very different from what they will be in the future (Kabir, et al. 1998). Yet it is important that information regarding this population be documented in order to facilitate an understanding of the situation of the aged in the country. Knowledge is essential to assist policy makers define, formulate and evaluate goals and programs and to raise public awareness and support for needed policy changes. So it is imperative to address their needs and capitalize on the potential of the growing population of older Bangladeshis and to assure that their needs are addressed.

Modernisation and its Impact on the Elderly : Bangladesh is an underdeveloped country. But some indicators show that it is now developing. My view is, this development is due to modernisation

process which is slowly but steadily occurring in the various sector of the society. According to Cowgill (1972, 127) modernisation is : "the transformation of a total society from a relatively rural way of life based on animate power, limited technology, relatively undifferentiated institutions, parochial and traditional outlook and values, toward a predominantly urban way of life base on inanimate sources of power, highly developed scientific technology, highly differentiated institutions matched by segmented individual roles and a cosmopolitan outlook which emphasized efficiency and progress."

This definition is very much pertinent to Bangladesh. Rural to urban migration in search of employment, increasing number of nuclear family, rapid urbanisation and industrialisation, increasing use of modern technologies and high yielding varieties in the agricultural sector, women participation in paid labour job outside of the family which is the reality of today and bi-product of this transformation.

Though this process bring blessings for the society but it is very difficult to ascertain to what extent our elderly get benefited form modernisation. Some research revealed that modernisation has positive as well as negative impact on the livelihood of the elderly. This transition process is not smooth and sometimes unplanned which contribute to widen social disparity and polarisation process, destroyed traditional way of life. The elderly of Bangladesh are unfortunate and silent victim of the whole process. Given the socio-economic condition, political instability and unplanned social change it is very difficult to forecast the situation of the elderly in future but today's experience is really worse.

Cowgill and Holmes (1972) in their studies found strong association with modernisation and decrease status of elderly. They reviewed studies of fourteen contemporary societies from around the world and found that the status of older decreases with increase in modernisation.

Whittington (1971) also found that though due to modernisation elderly enjoy more health facilities but even with improvements in health care, the elderly lost status relative to the young over the thirty years they studied. Cohn (1982) found that the status of the old does drop at the start of modernisation.

Increased poverty and decreased family income : who will get preference, children or the elderly ? There is little doubt that poverty poses a threat to the integrity of the family rural Bangladesh, eroding patriarchal and generational authority and weakening bonds of obligation between family members. While it is far from clear that economic conditions in Bangladesh have, in the aggregate, worsened during recent years, it is certain that the pool of landlessness and impoverished in rural areas has increased in number and probably in proportion, and that within this group the proportion of those who are desperately poor has also grown. For this segment of population, relative to the more stable and prosperous majority, life can truly be brutish and short, and the quality of life for those who survive to old age is likely to be very poor. (Maid T Cain, 1991).

Bangladesh has a huge number of existing elderly in the population and this number will grow. There is very little institutionalized support systems either the government and Non Governmental Organisation (NGO). Goldstein Scholar and Ross (1983; 722-723) argue that for Nepal and other Third World countries, “there will be ever increasing numbers of elderly parents who have neither property nor pensions nor savings in their old age.” Given the economic adversity facing many of their children and the already difficult choices they must make between providing for their own children or their elderly parents.

Declining fertility and nucleation of family size : Is it a Blessing or a curse for the Elderly ? A decline in fertility decreases family size, which may have repercussions for support in old age in a country like Bangladesh. Provision and care of elderly parents has traditionally been the responsibility of the children. The total fertility rate per woman has declined from 6.1 in 1980 (World Bank 2000) to 4.3 in 1990 and to 3.0 in 1999 (World Health Organisation 2000), indicating fewer children in families. With a projection of further decline in fertility rates over the coming decades (U.S. Census Bureau 2001), we must consider, the consequences for the care and support of elderly parents will be much more complicated.

Traditional norms and living arrangement of the elderly : Living arrangement are an important component of the overall well-being of the elderly. In Bangladesh, it has traditionally been the responsibility of the family to provide food and shelter for its elderly

members. More specifically, traditional norms in Bangladesh, as in other South Asian countries (Jefferys 1996), demand that sons are responsible for financial provision, while the daughters-in-law are responsible for providing day to day care. This tradition may be related to a situation where extended families resides together and/or to inheritance structures favouring sons. The traditional system of inter-generational co-residence is said to be widespread in Bangladesh. Martin's (1990) research in a number of countries of South Asian, including Bangladesh, gives evidence that the majority of elderly people continue to live within extended family settings both in rural and urban areas, though there may be variations by sex, area of residence and the socio-economic situation of the elderly. (Cain's (1991) research also points out that social changes have not eroded the significance of the joint family. Kabir et al. (1998) in their study mention that a large number of elderly people reported living with their offspring (rural. : 70% urban; 86%). Another 23% of the elderly people in the rural area report sharing the same residential compound with their children.

With socio-cultural changes such as rapid urbanisation, increasing number of women joining the paid labour force in both urban and the rural areas, and a rise in the elderly population, the extent to which traditional expectations fit with the 'realities' of life for the elderly in Bangladesh is a question which needs to be addressed.

Rural to Urban Migration and its consequence for the elderly : The largely rural economy of Bangladesh is experiencing a steady rise in urbanisation. The proportion of urban population has more than doubled from 9.3% in 1975 to 19.4% in 1997. By 2015, around one third (30.8%) of the total population is expected to live in the urban regions of the country (UNDP 2000). Migration of young adults from rural to urban regions is said to be the major contributory factor to urbanisation (Islam 1999). Migration in search of work may only compound problems, as those moving from rural areas to the cities to seek work face acute housing shortages. In such circumstances pressure on family life are extreme and the capacity to adequately care for the elderly is limited. A consequence of such migration on support for elderly people may imply that support requiring physical proximity, such as help with household tasks,

becomes impossible. Physical separation may also reduce financial support in terms of remittances, partly because of the high cost of urban living or the loss of emotional ties between parents and children as a consequence of prolonged absence.

Increasing women's participation in paid labour force and its implication for the elderly : Unpaid care-giving work or practical support is generally provided by women in Bangladesh. Time allocation figures between market-oriented and non-market oriented production activities for rural Bangladesh in 1990 show that women spend 65% of their time on non-market activities compared to 30% spent by men (UNDP 2000). Due to landlessness, underemployment and poverty in the country, more women now seek access to labour market than ever before; they work in the fields alongside men, and participate in the weeding, transplanting and harvesting of crops (World Bank, 1990).

It can be questioned whether the increasing number of women joining the labour force will mean that practical support to older persons may be jeopardized. Although statistics from Bangladesh show a dramatic increase in women's participation in the labour force from 5% in 1965 (UNDP 2000) to 42% in 1980, this figure has reportedly remained unchanged after almost two decades (World Bank 20000. It should be noted, however, that an increasing share in paid work by women does not necessarily reduce their load of unpaid work.

Are the elderly only passive recipients of Assistance from the Family and Community ? Older men and women in Bangladesh provide valuable contributions to the well-being and livelihood of the family by taking responsibility for household activities, freeing younger family members to seek work outside the house and by providing income. That they are only receiver and not giver' this notion should be dispelled. Abedin (1999) found that household tasks, described as non income generating work, are for the most part performed by females. For older females, the survey reports the majority of them doing cooking (85.7%) cleaning (69%) and laundry (70%) and take care of the property (70.8%). Studies by Kabir (1998) reports that more than 70% of men in both rural and urban areas reported having paid work. A greater proportion of women in urban areas (21%) have paid work than in rural areas

(13%). The occupations commonly reported by the elderly with paid work in the rural area included agriculture work and selling unskilled labor. In the urban area, on the other hand, business of varying sizes and services were commonly reported as the current main occupation of the elderly people receiving economic reimbursement (Table 5).

Table 5
Percentage Distribution of Elderly Population by Bangladesh by Economic activity and Sex
(Excluding household based economic activity)

Age & Sex	Total	Agri.	Indus.	Water/Gas supply	Const.	Trans.& Comm.	Busi-ness	Service	Other
National									
60 & over	100	65.8	5.4	0.13	0.93	0.76	11.2	1.7	17.6
60-64	100	63.6	2.1	0.1	1.02	1.0	12.1	1.7	18.3
65-69	100	66.6	1.7	0.2	1.0	0.7	11.7	1.7	16.4
70 +	100	67.3	1.6	0.1	0.8	0.6	9.9	1.7	18.1
Male									
60 & over	100	69.2	1.6	0.1	1.1	0.8	11.7	1.5	14.0
60-64	100	67.1	1.9	0.1	1.2	1.1	12.6	1.4	14.7
65-69	100	69.4	1.6	0.2	1.1	0.7	12.2	1.6	13.3
70 +	100	71.2	1.4	0.1	0.9	0.5	10.3	1.5	14.1
Female									
60 & over	100	16.6	3.5	0.1	0.5	0.7	5.4	3.7	69.9
60-64	100	17.1	4.9	0.1	0.6	0.2	6.1	3.7	67.3
65-69	100	18.0	3.0	0.1	0.6	0.1	6.0	3.0	69.0
70 +	100	14.9	2.7	0.1	0.4	0.3	4.1	4.1	73.4

Source : Bangladesh Population Census 1991, pp. 156-158.
Notes : Agri = Agriculture, Indus = Industries, Const. = Construction, Com = Communication

Paid work almost exclusively indicates household work in both areas, and primarily women report having responsibility.

Measures of assessing support have been criticized for often being focused on the receiving aspect of support and failing to capture the fact that support may be bi-directional (Berkman and Glass 2000). Kabir (2001) showed that provision of support appeared to be mutual between the elderly person and the family and seemed to occur simultaneously, although the type and quantity of support

may vary between providers and over time. Empirical data from rural areas of North wales show that majority of the elderly people give as well as receive practical and emotional support (Wenger 1984).

Gender and the Elderly : Do Elderly women face "Multiple Jeopardy ? : The story of aging in Bangladesh may be different, depending on whether one is women or a man (Ellickson 1988). Gender inequality and discrimination against women is widespread in Bangladesh. In contrast to normal demographic patterns, in Bangladesh women's natural tendency to live longer than men has been eliminated. This sex ratio pattern to Bangladesh is different from other countries where male mortality exceeds female mortality at the later age. Consequently predominance of female over male elderly are found in those countries and the case is reverse in the case of Bangladesh.

Table 3
Percentage Distribution of Elderly Population by Age, Sex and Type of Area

Age Group	National			Urban			Rural		
	T	M	F	T	M	F	T	M	F
60 & Above	5.4	5.9	4.8	4.3	4.6	4.0	5.6	6.1	5.0
60-64	2.1	2.2	2.0	1.8	1.9	1.7	2.2	2.3	2.1
65-69	1.05	1.2	0.9	0.8	0.9	.07	1.1	1.2	0.9
70 & Above	2.2	2.5	1.9	1.7	1.8	1.6	2.3	2.6	2.0

Source : Bangladesh Population Census 1991, pp. 80, 296.

This is a result of a lifetime of deprivation, lack of education, poor health and nutrition, low status, discrimination, and restrictions on mobility and association. Only 5% of women over the age of 60 are literate compared to 30% of men (US Department Census 1996). It is evident from the census of 1991 that the literacy rate of the country is 32.4 while the literacy rate of the elderly is 22.1 which is about 10 per cent lower than the country average. Thus the

significant observation in table 4 is that female elderly literacy rate is very low with extremely low in rural areas, only 6.2 per cent, in against of 16.4 per cent of urban female elderly.

Table 4
Percentage Distribution of Elderly Population by Literacy Rate, Sex and Type of Area

Age Group	National			Urban			Rural		
	T	M	F	T	M	F	T	M	F
Bangladesh (5 & Above)	32.4	38.9	25.5	27.9	34.0	21.5	48.5	55.0	40.8
60 & Above	22.1	33.2	7.7	19.9	30.6	6.2	33.7	46.6	16.4
60-64	21.8	33.0	8.6	19.3	30.0	6.9	34.0	46.62	17.6
65-69	24.9	36.5	8.9	22.3	33.6	6.9	38.6	51.6	19.8
70 & Above	21.1	31.9	6.3	19.3	29.8	5.0	30.9	44.1	13.4

Source : Bangladesh Population Census 1991, pp. 320-321,324-325.

Older women also own fewer assets and have control over family resources, and endure more chronic disease and disability than their male counterparts. Older women face both age and gender barriers in finding income generating opportunities. They are limited by social and cultural constraints in their activities and lack opportunities for employment/ income generating activities.

The majority of older women in Bangladesh are widowed (68%) compared to 7% of men. Remarriage among men after widowhood and divorce is fairly common, while remarriage among women is uncommon (Kabir et al. 1998). The pattern of high proportions of married men and widowed women is similar to that found in high income nations. The issue of widowhood is significant because a woman's marital status is of primary significance to her survival and well-being. Once a woman is widowed (or divorced), she is often denied access to resources as a husband's resources may be distributed among other family members or to an assigned male relative (Help Age International, 2000).

The fate of a Bangladeshi woman, however, is only partially determined by her children. Certainly the village women reaches the peak of her authority as the mother of married sons, but only as long as her husband survives. His death begins her descent to almost complete dependency. Aziz (1979) agree that with the death of her husband a wife loses rank, prestige and authority. As Aziz states "as long as the father remains head of the family, the mother is given responsibility for domestic management." In addition, Rahman (193) points out that there is evidence that widowhood, for women in particular is associated with substantial deterioration in socio-economic status in Bangladesh. As a result, windows have no security, are heavily dependent on sons/family, and have comparatively worse socio-economic situations as they lack opportunities to earn income and do not hold savings. Gender discrimination and inequality are carried into old age, making widows among the most vulnerable in society.

Productive aging and self help in the later life : What could we do ? Martin (1988), in his study showed that a majority of men in both urban and rural areas reported having an income. A high proportion of the elderly with income are found to be in the lower income backer in the rural area compared with the urban area. Women in both areas reported lower income than men. Older people are excluded form services and support Provided by NGO's. Their exclusion is due to age limits on participation in programs or to barriers (lack of information/ awareness, inappropriate services, difficult physical access etc.) that result in low or no uptake of services by older people. Credit is one potential resource for older people. However, most older people are unable to access micro credit or low interest loans from NGO's and GO programs due to explicit age-barriers or lack of training, skills or confidence. A number of community-based schemes for poor older people have shown that increasing access to credit, reinforcing existing capabilities and developing new ones, can reduce some of the barriers to economic activity (Gorman, 19960.

Out of over 1,500 NGO's with programs throughout Bangladesh, only a few target older people in their programs (Help Age International 2000).

Older people in Bangladesh are excluded often systematically - from access to services and support, justified by the inevitable restrictions of older age and perceived lack of capacity for contributions and self-help.

Recent Research : In developing countries like Bangladesh, the issue of aging has yet to gain needed attention and momentum (Islam 2001). Empirical studies are rare, and there is limited information available to shed light on the status of elderly, their survival, source of livelihood, etc. some sporadic studies have been conducted on aspects of the elderly.

Studies done on the aged in Bangladesh can broadly by classified into two groups : (1) Studies based on census and projected population data and (2) Studies based on data derived from small scale surveys. Most of these studies highlight aspects of the demographics of aging, the current situation and future trends, giving an overview of the impact of the aging population on state and family resources, assessment of the problems facing the elderly, and policy implications.

Kabir (1994) conducted a case study of the characteristics of the aged in Bangladesh which was a by product of a U.N. regional ESCAP (Economic and the Social Commission for Asia and the Pacific) meeting on local level policy development and the consequences of population aging. This case study included a purposive sample of 342 rural men and 158 rural women. The population was drawn from 5 thanas of five divisions. As the study is limited to rural areas and does not provide an analysis disaggregated by sex, no inferences can be drawn about the urban elderly population or about differences between older men and women. Findings of the study indicate that the elderly in rural Bangladesh are not in good shape. They have, so far, been mainly supported by their adult children, but due to deteriorating economic conditions, this support is not likely to continue in the future. In addition, rural-urban migration of the adult members of the family is a very common feature now. This is creating problems for the elderly as they are left behind in the rural areas, uncared for and lonely.

Kabir et al. (1998) conducted a multi-dimensional survey assessing the health care needs of the elderly in urban and rural

Bangladesh. Using a multi-stage method to select the study sample, the survey covers socio-economic and demographic characteristics of the elderly, family support, functional ability, illness experiences of the elderly, and their utilisation of health care facilities. The study fond that the elderly are mostly supported by their adult children. Ill health seems to be the main problem (the most common ailments are diarrhea followed by asthma, peptic ulcer, and diabetics). Most are in financial hardship and they suffer from tension and anxiety due to a variety of socio-psychological problems. The condition of aged women, particularly those widowed and deplorable. Almost all elderly are in need of financial assistance, recreational facilities, health care facilities and so on.

Help Age International (2000) investigated the situation of elderly people in Bangladesh in four different areas. The surveys covered urban and rural areas in and around the two major cities providing information about marital status educational level, employment status, income levels, dependency status, health conditions, interaction with others and participation in family decisions, and some information regarding the caregivers role etc. The study found that elderly in both rural and urban area are facing the economic hardship and health problem. Particularly, the elderly living in the urban areas are feel loneliness, isolation because of lack of peer network and formal support system.

Rahman (2000) tried to underscore the complex dynamics of the relationship between living arrangements and the health status of elderly persons in several developing countries. The study used newly collected comprehensive data to examine the impact of living arrangement (particularly the presence of various family members) on self-reported general health and limitations in activities of daily living for older adults aged 50 years and over in rural Bangladesh. Rahman concludes that, for older men (controlling for age, education and household assets), a co-resident spouse does not have any impact on self-reported general health or on self reported Activities of Daily Livings (ADLs). On the other hand, for older women, a co-resident spouse has significant positive impact on self-reported general health but not on ADLs. The study emphasizes the need for more research to investigate the overall state of the elderly in respect of the family

and kinship ties, support system, and care giving in the context of the overall development process of the country.

Government Intervention towards the Situation of the Elderly : Despite the large elderly population in absolute terms and the steady rise in relative terms, attention given to this population by policy makers in the country has remained negligible. National policy for the elderly population in Bangladesh is nearly non-existent to date. A monthly allowance has been introduced, since the 1997-98 budget year, of Taka 100 for the 10 poorest elderly persons at the level of the smallest administrative unit of the country. Approximately 400 000 elderly individuals throughout the country will thus receive the allowance (Help Age International 2000). At least fifty percent of the recipients of this allowance are required to be women (Kabir et al. 1998). In order to provide basic support to poor elderly people, the fifth five-year plan of the government of Bangladesh (1997-2000) aims to establish centers for old people with facilities for light income generating activities and provision of medical and social services. Only 0.5% of the total welfare budget has been earmarked for providing welfare services to 'the aged and the infirm' (Planning commission, 1998).

Public health in Bangladesh has traditionally focused on the younger population, especially children and women in their reproductive years. Until now, the needs of the elderly people have not been considered a major issue in the country. Bangladesh has neither separate health care provision nor infrastructures for elderly people. There is only one non-government organisation (Bangladesh Association of the Aged and Institute of Geriatric Medicine) in the country that explicitly address the health problems of this particular section of the population on a limited scale.

Some Policy Implications : The elderly population in Bangladesh has been increasing and it has become a concern of families as well as of society. Although in Bangladesh the "elderly problem" is not yet a serious one, in the near future it will have serious implications because of lack of support from the family and the community. Government and non-government development programs should give priority to those sons/ daughters who are the primary source of support for an older relative, to strengthen and

promote the capacity of the family to provide support to the older population.

Given this situation, the needs of the poor elderly of Bangladesh should be addressed through integration of older persons into existing and future community development and poverty alleviation programs.

Micro credit programs should consider including the elderly population taking into consideration their different capabilities and needs. Support should be targeted to the most distressed and vulnerable elderly people such as those who have no family support and who are widowed. In the poor and poverty sricken families the elderly population is considered a burden. To increase their acceptance, physically capable elderly persons should be given the opportunity to earn independently. Greater access to income earning opportunities for elderly population would bring them dignity, and it would increase respect of family members towards them.

The government elderly allowance program is an encouraging step towards the welfare of the elderly population, but it reaches a fraction of the elderly population in rural Bangladesh. The coverage should be increased.

There are quite a good number of vulnerable older persons whose families are no longer able to offer support or who have not family. These groups of older persons include the destitute, the low or no income, the minorities, the displaced and disabled and person with long term medical conditions. They require direct humanitarian assistance. These groups should receive special attention and be adequately covered by the social safety net. The government should identify and assess the size of these groups and the extend to which assistance is required. The widows should get attention to meet their special needs.

Government and NGOs (Non Government Organisation) should introduce public education program to raise more awareness, about issues faced by older persons. Program should be undertaken to enhance the public skills, knowledge and attitude regarding caring of the elderly population. To raise awareness about aging and older people's and to promote changes in attitudes towards elderly,

policies and actions among decision - makers and NGOs should be concomitant.

Conclusion

Population aging is emerging as a serious issue in Bangladesh and is becoming a serious concern for the development agendas. But the country seems to be less aware of the consequences of an aging of population perhaps this is due to reasons that the country is now facing with more pressing issues related to poverty, malnutrition, unemployment, illiteracy and so on. Public concern with population aging is even more recent. Government as policy makers, and society at large, as advocators probably are not prepared right now, to respond to the newly emerging issues involving in the process of growing old, or to anticipate the different and much more complex problems with which the elderly have to cope.

There is considerable evidence that traditional system of family structure, composition and functioning are undergoing a change under the impact of mass education, exposure to mass media, formalisation and commercialisation of economics, industrialisation, urbanisation growing individualism and so on (Hugo, 1996). With the rapid socio-economic and demographic changes taking place within the society, the basic characteristics and experiences of the elderly in Bangladesh today are probably very different from what they will be in the future.

Viewing the aged population as a significant and vulnerable group to the people in our national life and society there is a need to explore the situation of the elderly in order to have clear understanding of the problems and issues arising out of population aging in the country.

References

Bulletin on Aging, No. 2/2002, published by the United Nations Department of economic and Social Affairs / division for Social Policy and Development.

World Population Projections to 2150, (United Nations Publications) sales No. E 98. X 111,14.

World Bank News Release No. 2000/227/SAR, February 27,2000.

ESCAP Population Data Sheet, 1999.

Amin, S. Family structure and change in rural Bangladesh, Working Paper No. 87, New York : The Population council, 1996..

Abdus Samad and Samad Abedin. "The implications of Asian's Population Future for the Family and the Elderly : Bangladesh" *Asian Population Studies Series* No. 151. ESCAP, United Nations, New York, 1999.

Abedin, S. "Population Aging in Bangladesh : Issues and Perspectives". in Implications of Asia's Population Future for Older People in the Family, *Asian Population Studies Series No. 145*, ESCAP, Bangkok, 1996.

Aziz, K. M. "*Kinship in Bangladesh*". Dhaka : International Center for Diarrhoell Disease Research, 1979.

Berkman, L.F. and T. Glass. "social integration, social networks, social support and health". In : L.F. Berkman and I Kawachi, eds. *Social Epidemiology*. New York : Oxform University Press, 2000.

Cain, M.T. "The Activities of Elderly in Rural Bangladesh," *Population Studies*, 45 : 189-202, 1991.

Chaudhary, H. "*The Aged in Bangladesh*", In Aging in South Asia A.de Souza and W. Fernandez, eds. pp. 62-83. Delhi, Indian Social Institute, 1982.

Cowgill, D. "A Theory of Aging in Cross-Cultural Perspective". In Cowgill and L. Holmes (eds). *Aging and Modernization*, New York : Appleton Century Crofts, 1972.

Cowgill, D. and Holmes, D. *Aging and Modernization*, New York : Appleton-Century-Crofits, 1972.

Cohn. R. Economic development and Satus Change of the Aged. *American Journal of Sociology*, 87 : 1150-61, 1982.

Davis R. Peter. *Rethinking the Welfare Regime Approach : The Case of Bangladesh*. Sage Publications, New Delhi, Vol. 1 (1) : 79-107, 2001.

Ellickson, J. Never the Twain shall meet : Aging Men and Women in Bangladesh. *Journal of Cross Cultural Gerontology*. Vol. 3 pp. 53-70, 1988.

Help Age International. *Uncertainty Rules Our Lives : The Situation of Older Persons in Bangladesh*. Unpublished Research Monograph, Asia/ Pacific Regional Development Center, Chiang Mai, Thailand, 2000.

Haque, M. A and Abedin, S. "Old-age mortality in Matlab : A multiple decrement analysis", in *Proceedings of the International Seminar on Aging in SAARC Countries* : pp. 92-98, Department of Statistics, Rajshahi University, Dhaka, 1996.

Islam. A.K.M.S. Social Aspects of Aging in Bangladesh : A Case Study of Rajshahi City, Paper No. 15, CPD-UNFPA Program on Population and Sustainable Development, Center for Policy Dialogue, 6/a Eskaton Garden, Ramna, Dhaka, Bangladesh, 2001.

Kabir and Salam. The effects of various interventions on the Welfare of the Elderly : Evidence from Micro-study, Paper No. 17. CPD-UNFPA Program on Population and Sustainable Development, Center for Policy Dialogue, 6/a Eskaton Garden, Ramna, Dhaka, Bangladesh, 2001

Kabir M.H. "Demographic and Socio-economic Aspects of Aging in Bangladesh." *Aging of Asian Populations*, 52-57, 1994.

Kabir et al. "Aging trends-making an invisible population visible : the elderly in Bangladesh," *Journal of Cross-Cultural Gerontology*, 13 : 361-378, 1998.

Mizan Ainon Nahar. In Quest of Empowerment. The Grameen Bank Impact on Women's Power and Status. University Press Limited. Dhaka, Bangladesh, 1994.

Martin, L. *The Aging of Asia Journal of Gerontology : Social Sciences*, Vol. 43, No. 4 pp. 99-113, 1988.

Martin, L. The status of South Asia's growing elderly population. *Journal of Cross-cultural Gerontology*. Vol. 5, No. 2, pp. 93-117, 1990.

Perera, P.D.A. Emerging Issues of the Aging of Population in Sri Lanka. In *Population Aging : Review of Emerging Issues*. pp. 53-58. Bangkok : Economic and Social Commission for Asian and the Pacific, United Nations, 1987.

Rahman. Living Arrangements and The Health of Older Persons in Developing countries : Evidence from Rural Bangladesh. Harvard University Press, United States of America, 2000.

Samad and Abedin. "Implications of Asia's Population Future and the Elderly : The Case of Bangladesh," *ESCAP*, 1998.

Samad, Abdus. "Household Structure and the Role of Older Persons; Surveys of Living Arrangements", *ESCAP*, 1998.

United Nations. World Population Prospects : The 2000 Revision. Draft, ESA/P/WP. 165, 2000.

United Nations Development program. Human Development Report 1999, 2000.

Wenger, G.C. The supportive network : Coping with old age. London : George Allen and Unwin, 1984.

World Bank. Strategy Paper on Women in Development. Washington, D.C. The World Bank, 1990.

World Bank. World Development Report 2000/2001 : Attacking Poverty. New York, Oxford University Press, 2000.

World Health Organization. World Health Report 1999 (Online). Available from : http://www.who.int, 2000.

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Views of elderly women on their Social and Mental well being in Modern Society

P. Sandhu and R. Bakhshi

ABSTRACT

Analysis of changing scenario and its impact on social life and mental well being of elderly women was done on 120 elderly female respondents from six cities of urban Punjab taking into account both positive and negative sides of these changes on their social life and mental well-being. Results of the study revealed mixed impact. There was positive impact on social life of elderly with changing times and the leading factors suggested by the respondents were better communication system and transportation facilities. A negative impact of changing times on mental well-being was evident from the views expressed by respondents and strongest feeling was 'loneliness and alienation in the lives of elderly is fast growing due to changing society', 'Elderly are more sad and depressed in the materialistic world' and 'feeling of mental insecurity is more due to lack of moral support from children these days'.

Keywords : Elderly women, Social Life, Alienation, Mental Insecurity, Materialistic World.

During the last few decades, there has been a tremendous increase in the population of elderly persons in the world and we have the phenomenon of 'population ageing' (Bhandari, 1999). In India, the plight of old is cloaked by myth or traditional bond (Dandekar, 1996). But the complexion of modern society has undergone a phenomenal transformation due to technological revolution and urbanization accentuating problems of the elderly (Singh *et al.,* 1987). The scenario is changing and creating it's impact on the elderly. According to National Sample Survey Organisation, reported by Narula (1998), 36.7 per cent of 70 million elderly people wanted to shift to old age homes because they can't manage alone. Keeping in view, the changes which have taken place with time, a need was felt to analyse its impact on social and mental well-being of elderly in India. Hence the present study was undertaken with the following objectives :

1. To examine demographic features of the elderly women of urban Punjab.
2. To view the impact of changing scenario on the social life and the mental well-being of the elderly women in urban Punjab.

Methodology

Field survey was conducted in Punjab state, and two cities from each of the three cultural regions were randomly selected. Four localities from each city were selected randomly. A sample of five elderly women (60 years and above) was selected from each locality on random basis. Pre-tested interview schedule was used to get relevant information from the selected sample of 120 respondents. Simple averages, percentages and weighted scores were used to analyse the data. Five point scale for 'agreement level' was used.

Results and discussions

Demographic Features of Respondents and their Families

It included age, education and marital status of respondents, their living arrangement, financial status, and socio-economic variable of the families.

1. **Age, education and marital status of the respondents**

It is seen in Table 1 that maximum number of respondents (51.67 percent) belonged to age category of 60-69 years and minimum respondents (21.66 percent) were above 80 years of age. Widows constituted 43.33 percent of sample. Only 9.16 percent respondents were illiterate; 17.50 percent could read and write without any formal education, 50.84 percent had done schooling, and 22.50 percent had gone to college.

2. **Living arrangement of the respondents**

Table also shows that only 9.16 percent respondents lived all alone and 18.33 percent lived as a couple. Majority of respondents (72.50 percent) lived with their children (38.34 percent as couples and 34.17 percent as widows). It was also observed that 95 percent respondents lived in their own houses.

3. **Financial Status of respondents**

It is revealed in Table 1 that 29.16 percent respondents had no income at all. For others, biggest source of income was pension as disclosed by 43.33 percent respondents. Maximum number of respondents (45.84 percent) received more than 1000 Rs p.m. as their personal income, and minimum amount (upto Rs. 250 p.m.) was received by 35.83 percent respondents.

Table 1

Demographic features of respondents

Demographic Features	Number of respondents	Percentage
Age (Years)		
60-69	62	51.67
70-79	32	26.67
80 & above	26	21.66
Marital Status		

Married	62	56.67
Widowed	58	43.33
Education		
Illiterate	11	9.16
Can read & write	21	17.50
Schooling	61	50.84
More than schooling	27	22.50
Living arrangements		
Live all alone	11	9.16
Live with spouse	22	18.33
Live with children & spouse	46	38.34
Live with children only	41	34.17
Source of Income		
Nil	35	29.16
Pension	52	43.33
Savings	37	30.83
Dividends & interest	34	28.33
Rent	22	18.33
Allowances	5	4.16
Income received (Rs.)		
Upto 500	43	35.83
500 - 1000	22	18.33
1000 & above	55	45.84
Type of Family		
Joint	87	72.50
Nuclear	33	27.50
Size of Family (Number of members)		
Upto 2	28	23.33

3- 5	40	33.33
5 and above	52	43.34
Income of Family		
Upto 10,000/-	67	55.84
10,000/- - 20,000/-	46	38.33
20,000/- and above	7	5.83

* Multiple responses

4. **Socio -economic Variables of the Families**

Table-1 further shows that the majority (72.50 per cent) of respondents were living in joint families. The family size in case of 43.34 percent families was 5 or more than 5 members. Large number of (55.84 percent) respondents had family income up to Rs. 10,000 p.m. and in case of very few respondents (5.83 percent) the family income was Rs. 20,000 and above.

Impact of Changing Scenario on the Social Life of Respondents

Table 2 revealed that most convincing positive view of respondents regarding changing times and its effect on their social life was that 'better communication system viz., telephones and mass media has brought elderly people closer' and that transportation facilities like cars and other vehicles have made 'carrying out social obligations easier and more frequent' for elderly people (mean score 1.31) followed by their feeling that the eradication of social evils (child marriage, polygamy and sati system) has brought relief in general to women (mean score 83). 'People are more prosperous and uplifted' viz. abolition of Zamindari system, land reforms and shift in occupational structure; and that 'emergence of social reforms (widow remarriage, universal education to females, dowry ban, legal protection and right of women to ancestral property) has strengthened womens' position in general, was also agreed by respondents with mean scores of 0.83, 0.44 and 0.37 respectively.

Table 2

Impact of changing scenario on social life of respondents

Impact	Weighted score
Positive Impact	
Better communication system brought people closer	
– Transportation facilities made carrying social obligation easier and frequent	1.31
– Eradication of social evils brought relief to women	1.31
– People more properous and uplifted socially too	0.83
– Social reforms strengthened women's position	0.44
– Emergence of progressive thinking and liberal society	0.37
– Society less interactive with elderly	-0.01
Average Score	**-0.24**
Negative Impact	
Respect for elderly diluted	
– Isolation among elderly increased	0.93
– Pleasures of outdoor life decreased for elderly	0.79
– Society less interactive with elderly	0.75
– Elderly left alone to fend for themselves	0.73
– Status of elderly sharply declined	0.50
– Traditional role of elderly uprooted	-0.10
– Importance of elderly decreased	-0.16
– Elderly felt as they are no more reservoir of knowledge and experience	-0.27
– No place of elderly in modern definition of family	-0.53
– Headship' in family shifted from elderly topowerful	-0.73
Average score	**0.11**

(Scoring : Strongly Agree - 2, Agree -1, Neutral -1, Disagree-1, Strongly disagree-2)

Views regarding the negative impact of changing times on the lives of elderly people clearly indicates that respondents felt most strongly that in modern society 'respect for elderly has diluted' (mean score 0.93) followed by the feeling that 'isolation among elderly has increased' due to dying out of close knit relations in the society (mean score 0.79). Respondents also felt that 'pleasures of outdoor life for them are less' these day due to growing self sufficiency within families viz., television and other kind of indoor entertainment (mean score 0.75). 'Society is less interactive with elderly' these days affecting their well being (mean score 0.73); and that the migration of children to work place and their desire to settle separately after marriage leave elderly to fend for themselves alone (mean score 5.0) was also felt by respondents.

Average score of 0.57 for positive feelings of respondents was higher than the average score of 0.11 of negative view agreed upon by them. So it may be concluded that generally respondents felt that with changing scenario there social life is also benefited. Results of Dayal (1978), Bhattercharjee (1982), Prasad (1983) and Nagesh (1987) also point out some changes in the social life of elderly people.

Impact on Mental Well Being of Respondents

In Table 3 views of respondents regardings positive and negative impact of changing scenario on mental well being of elderly in changing times can be observed. Thorough perusal of the table indicates that respondents disagreed on the positive views regarding the strengthened mental position of elderly women and felt that 'required importance has come through because elderly population is getting attention internationally' (mean score - 0.37). However respondents agreed to certain views regarding negative impact of changing times on mental well-being of elderly viz., 'loneliness and alienation in the lives of elderly is fast growing' due to changing society, 'elderly are more sad and depressed in the materialistic world' and 'feeling of mental insecurity is more due to lack of moral support from children these days' with mean score of 0.79, 0.39 and

0.37 respectively. They also agreed that elderly are mentally more stressed in today's competitive world and have more worries and tensions due to growing uncertainties these days (mean score 0.36) and that the peace of mind of elderly is adversely affected in noisy environment (mean score 0.06). Average score was -0.18 for the positive views and for negative views average score was 0.15; depicting the feeling that respondents did not agree to any good signs of mental well being of elderly in today's life. Sharma (1980), Nayar (1987), Nagesh (1987), Deb (1988), and Bose (1990) also revealed problems like loneliness, isolation and neglect faced by elderly in today's society.

Table 3

Impact of changing scenario on mental well being respondents

	Impact	Weighted score
Positive Impact		
–	Elderly are more mentally sound	0
–	Required importance has come through international recognition of geriatric population	-0.37
	Average Score	-0.18
Negative impact		
–	Loneliness and alienation among elderly fast growing	0.79
–	Elderly more sad and depressed	0.39
–	Increased feeling of mental insecurity among elderly	0.37
–	Elderly more mentally stressed	0.36
–	Elderly have more worries and tensions	0.36
–	Peace of mind adversely affected	0.06
–	Elderly feel useless and a burden on society	-0.24

–	Can not perform 'puja' peacefully due to small houses	-0.29
–	Frustration in elderly has increased	-0.38
	Average score	**0.16**

Conclusions

1. Maximum respondents were 60-69 year old, married, lived with children and spouse, had done schooling and had income from pension for financial support
2. There was positive impact on social life of elderly with changing times and the leading factors suggested by respondents were better communication system and transportation facilities.
3. A negative impact of changing times on mental well being was evident from the views expressed by respondents and strongest feeling was 'loneliness and alienation in the lives of elderly is fast growing' due to changing society, 'elderly are more sad and depressed in the materialistic world' and 'feeling of mental insecurity is more due to lack of moral support from children these days'.

References

Bhandari, A. Helping the aged. *The Tribune*, 119 (154) : 10, 1999.

Bhattercharjee, B.N. Changing family system in India. *J. Family Welfare* 25 : 42-47, 1982.

Bose, A. *Aspects of aging in India. Social Action* 32 : 2-9, 1982.

Deb, M. Younger generations perceptions of the old members of rural and urban families. *Indian Psychological Review*, 33 : 24.31, 1988.

Dandekar, K. *The elderly in India*. Saga Publications, New Delhi, 1996.

Dayal, P.D. Aging and society. *J. Social Welfare* 25 : 6.10, 1978.

Nagesh, H.V. Care of the aged in Karnataka. *J. Social Welfare* 34 : 4-6, 1987.

Nayar P.K.B. *Ageing and Society*. Social Welfare 34 : 28-31, 1987.

Naurla R. The now where people. *The Tribune* : *Saturday Plus* 118 (253) : 1, 1998.

National Sample Survey Organisation. 42nd round Government of India, 1989.

Prasad P. Problems of the Aged in Rural India. *J. Social Res.* 32 : 12-15, 1983.

Singh, R. Singh, K. and Sharma M.K. Economic problems of aged women. *H. A. U. Journal of Research* 17 : 199-202, 1987.

Sharma P.S. Treat them with dignity and love. *J. Social Welfare*. 26 : 2-10, 1980.

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Old Bachelors In Rural Areas : A Study of their Social Status, Conditions and Problems

Hitesh Kumar N. Patel

ABSTRACT

The present study aims to find out social status, conditions and problems of the bachelors (N=50) of the age of sixty and beyond in the rural areas of Gujarat. Majority of them were illiterate, with no personal earnings (income). Majority of these old persons aspired to marry in their young age. However, for several reasons they remained bachelors. Now they feel pain and shock for it. Some of these old persons remained bachelors on their own will. Majority of the old persons now stay with their relatives on paternal side. They often suffer scorn and humiliation from them. Majority of them feel that they do not have respect in their family and society. They feel that their position in the family and in the society has gone down in comparison to the position they used to enjoy in their young age. Majority of these old persons face (confront) the problems of social, economic, physical (health) mental kinds and of how to spend the unending time of leisure.

Keyword : Old Bachelors (Unmarried Men), Family Status, Social Stauts, Life conditions, Problems.

Indian social scientist and NGOA sscholars have not paid adequate attention to several social problems in rural areas. In rural community, old bachelors lead a life of neglect, pain, dependence,

and helpless condition. In the castes in which the dowry system still prevails, men and women are in unequal number. Earlier parents used to be inattentive to the birth growth and upbringing of female children. In the present time, innovations in the medical science enables a person to know the gender of a child before its birth. If one knows that a child still to be born is a girl, he prefers to go for abortion. This causes inequality in numbers of men and women. It further causes some men to stay unmarried (bachelors).

METHODOLOGY

(A) Objectives of the study :

1. to assess socio-economic back ground of old unmarried persons of rural areas.
2. to find out the reasons for their bachlerhood (or not getting married).
3. to collect information about these elderly bachlers position in their families and in communities to which they belong.
4. to collect information about life styles of these old persons and the problems they face.

(B) Sample :

Fifty unmarried old persons in the age group of sixty and above residing in rural areas of the Kheda and Anand districts were selected for the study by random sampling method.

(C) Tool :

An Interview schedule was used to collect data. In order to collect facts and relevant information a questionnaire was also used.

(D) Procedure of Data Collection :

In order to collect information in the context of the objectives of the study, Old age Bachelors were interviewed at their residences according to their convenience in the absence of other members of their families.

RESULTS AND DISCUSSION

Socio-Economic Back ground :

The old persons covered under the study were different age groups such as : 40% younger old persons (in the age group of 61 to 65 years), 30% middle old persons (in the age group of 66 to 70

years), 20% old persons (in the age group of 71 to 75 years) and 8% fully old persons (of the age of 76 years and above).

The old persons of this sample may be grouped in terms of their level of education like : 70% illiterate, 20% of them had primary education, 8% of them were educated up-to the S.S.C. while only 2% of them were graduates.

In terms of economic occupation, some 52% of these old persons were found to be engaged in no occupation or business. It means that they are leading a retired life. 18% of them are occupied in agriculture, 8% of them in cattle rearing, 20% are engaged in manufacturing of beedies and 2% are doing business.

In terms of their annual income it was found that 60% of the old persons do not have any personal income. 20% of them are earning less than Rs. 5,000/-. 10% of them are earning between Rs. 5001 and Rs. 10,000. 6% of them are earning between Rs. 10,001 and Rs. 15,000 and about 2% of them have annual income above Rs. 15,000.

In terms of religion, 90% of the total sample of this study were only Hindus, 6% of them were followers of the Islam and 4% of them were Christians.

Reasons for Staying Bachelors (Unmarried)

94% of the old persons under the present study informed (explained) that in their young age they had desire to marry. But conditions of various kinds such as family, economic, personal etc. did not allow them to fulfill their desire and they remained unmarried. Some respondents remained unmarried because of less number of women in their community in comparison to men. Physical inability on their part, having no sister in the family (where their society had adopted barter system of marriage) poverty and lack of wealth, crime committed in the young age, bad habits like drinking and gambling since the adolescent, bad reputation of the family, physical deformity on their part, bad luck were the reasons reported by these subjects for their bachelorhood. While informing about these reasons the respondents expressed regret for staying unmarried.

6% of the respondents of this study said that they stayed unmarried out of their own will. The reasons for their preference for

bachelorhood include their desire to lead a peaceful life, to attain spiritual progress, to live independently all through life, to undertake the responsibility of younger brothers and sisters following their parents' death (sad demise) etc. Such respondents do not regret over their present state of bachelorhood. In response to a question-whether they still approve of their decision, to remain a bachelor, that they took in their young age? 4% of these respondents still show consent to their decision, while 2% of them reported that their decision was hasty, that is, it was taken under the immaturity of the young age, or under the pressure of feelings for the family. Such decision lacked proper understanding on their part.

The respondents were also asked-whether they still think of marrying (wish to marry) ? 90% of them expressed that since they are heading quickly towards the end of life, thereby the question of marriage at this age does not arise. While 10% of them who were fit both physically and mentally, active and earning adequately (old persons in the age group of 61 to 65 years specifically) expressed frankly that they would like to marry provided they get a suitable partner who can give them love and warmth and share their feelings, having understanding and also supportive. Marriage would prevent their life from becoming unbearable and miserable like the hell. One remarkable thing was noticed with these respondents that their wish for marriage was not motivated by sexual lust or any such physical passion. The chief motivation behind their wish for marriage was to get rid of boring loneliness in their later life. They want support from a sensible partner at this age.

With Whom do the Respondents (Stay) Live at Present

Some 64% of the respondents stay at present with their relatives on the paternal side, while about 16% of them stay with their relatives on the maternal side, About 4% of them stay with their friends, or with a landlord's family for whom they work, or with a priest in a temple. Some 16% of the respondents stay independently on their own.

Position in a Family and Community (Society)

The 64% of the respondents who stay with the relatives on the paternal side expressed that they often become the victim of scorn, anger and humiliation mostly by women in the families. Women

behave rudely with them. They are pained and shocked for such treatment. They feel alienated. They do not play any significant role in families. They have to perform those tasks which are asked to do by members of the family. The work almost like servants.

The 16% of the respondents who stay with relatives on the maternal side expressed that the members of the families treat them with love and feelings. Thye are very happy for such treatment. Various of their wants are attended duly. However they do not perform any significant role in families.

Another issue was the kind of position or status that unmarried old persons enjoy in their society. On talking to the respondents on this isue, some 84% of them informed that in comparison to their young age, they now in their old age feel like losing a glory in their social position. Some 20% of them informed that they are addressed by others in the society with derogatory words like “vandha”, “bajrang” indicating scornfully on their bachelorhood. They even hurt (insult) them with contemptuous invitation like ‘come’. “I will get you married”, etc. Some 16% of them said that they find no change in their social position in their old age as compared to what they felt in the young age. Old persons who stay unmarried on their will, receive pension after the retirement, are healthy and active and educated and are engaged in useful activities for the society. They feel that their position in the society is retained duly. They still receive respect and love from others. Even today people approach them for counselling, suggestion and guidance on various subjects.

Condition of Life and Problems

84% of the respondents suffer loneliness. They always feel that they do not have a friend or a companion. Such persons do not have personal earning. They are confined to bed due to prolonged illness. Such respondents feel helpless. They are dependant on others. They suffer the pain of such condition. Their daily needs like food, medicine, cloths, etc. are duly met with. But their psychological needs like love, security and warmth are not attended duly. Impaired vision, impaired hearing, physical inability to utilize the leisure with any kind of activity and shortage of money are the factors to cause impediments in fulfillment of several of their desires. Even if they wish they are unable to go on a pilgrimage or do charity. These are the problems they face acutely.

Such respondents are unable to get new friends in place of those friends who have migrated elsewhere or have passed away. Such conditions add to their perplexity.

Suggestions

- The government should extend financial help on regular basis to needy elderly bachelors.
- Society should organize social gathering for match making specially for old persons who could not marry for the want of a suitable partner in their younger age and still want to marry.
- Supportless old widows should be encouraged for re-marriage.
- Society should approve of old persons' marriage.
- A family and a society should show adequate attitude and behavior befitting to humans.
- Young generation should learn to respect their eldders in the society. For the purpose, stories, poems and incidents illustrating human behavior of love, feelings, respect should be incorporated in school and college curriculum to provide inspiration to young people.

References

Desai, K.G. and Rekha Bhalla : *Social situation of Aged*, Bombay, Tata Institute of Social Science, 1978.

Nair, T.K. : *Older People in Rural Tamil Nadu*, Madras, Madras School of Social Work, 1980.

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