ISSN 1449-8677

ME-JAA

Middle East Journal of Age and Ageing

DECEMBER 2007

VOLUME 4 ISSUE 6



Focusing on the health issues of the elderly in the Middle East and beyond

www.me-jaa.com

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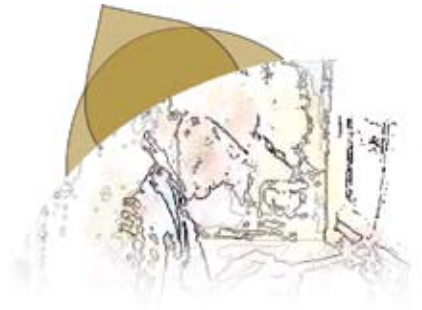
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Editorial

Author
Dr Abdulrazak Abyad
Chief editor

This is the last issue this year. The year has witnessed great improvement in the number and quality of papers and the frequency of the journal was increased to six issues per year in addition to the issuing of hard copies.

Our success is due to the contribution of the various authors from the region and the world, and the hard work of the production team.

In this issue a paper from Turkey looked through a cross sectional study at the relationship of falls, quality of life and depressive symptoms among community dwelling elderly. The study group which consisted of 250 seniors. In addition to demographic data, Health Related Quality Of Life Questionnaire Short Form 36 (SF 36), Mini Mental State Examination (MMSE) and Geriatric Depression Scale (GDS) were also performed for all subjects. Rate of falls was 26,6%. There were some parameters of quality of life questionnaire associated with falls. MMSE scores were also correlated with falls history. GDS were higher among those with insufficient social relationships. The authors concluded that the elderly with a history of falls were somewhat more exposed to socio-psychological inconveniences. They stressed that comprehensive geriatric assessment must be utilized widely in order to achieve early detection of the geriatric syndromes and to offer an individualized preventive approach for the senior citizens.

Two papers from Bangladesh dealt with population ageing. The first papers carried estimates of some mortality measures such as age specific death rates (ASDRs), crude death rate (CDR), infant mortality rate (IMR), infant death rate (IDR) and child mortality rate (CMR) of Bangladesh in 2007. The secondary data on life expectancy at birth of Bangladesh is taken from UN (2006). These estimates are compared to the corresponding values of Bangladesh in 2005 and it is observed that these are showing a decreasing trend during 2005-2007. The second paper analyzed the dynamics and some aspects of ageing prevailing in Bangladesh. The author stressed that fertility and mortality decline with increasing the older population in Bangladesh.

Tareque I, Haque M, Mostofa G et al looked at Age, Age at Marriage, Age Difference between Spouses and Women's Empowerment. The authors stressed that women's empowerment has, during the last decade, become a panacea for Third World development. The authors constructed a women's empowerment index and then studied the plausible relationship among women's empowerment and age related variables like age, age at marriage, age difference between spouses etc. This study revealed that the empowerment of women increases with age and age at marriage of women.

Helvaci MR, Kaya H, Borazan A, Ozer C looked at breaking points of life for major health problems. The authors studied a total of 1068 cases . and they found that prevalences of hyperbetalipoproteinemia, hypertriglyceridemia, dyslipidemia, and excess weight showed their most significant progressions in the fourth decade of life ($p<0.001$ for all). Diabetes mellitus (DM) showed its most significant progression in the fifth ($p<0.001$), and hypertension (HT) and coronary heart disease (CHD) in the sixth decades of life ($p<0.001$). The authors concluded that aging may be one of the major disorders of human being, particularly in the presence of excess weight, and probably there are some breaking points of life for dyslipidemia, excess weight, DM, HT, and CHD with this order, and dyslipidemia may be a pioneer sign of excess weight.

Original Contribution/Clinical Investigation

Association of Falls, Health Related Quality of Life Assessments and Depressive Symptoms Among Community Dwelling Elderly: A Cross-Sectional Study

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ABSTRACT

Background: Effective planning of health services depends on properly determining the risk factors. A cross-sectional study was planned to define the social and economic concerns, health behaviours and their interactions with life quality measurments among elderly who live in the Fatih district of Istanbul.

Materials and Method:
A district (Fatih Veledi Karabas district) was assigned in Istanbul. All inhabitants who were sixty-five years old or more were included. The study group which consists of 250 seniors, included 159 female (63.6%) and 91 male (36.4%) subjects. All subjects were visited at home. In addition to demographic data, Health Related Quality Of Life Questionnaire Short Form 36 (SF 36), Mini Mental State Examination (MMSE) and Geriatric Depression Scale (GDS) were also performed for all subjects.Additionally, research was conducted pertaining to self evaluation of their social and economic circumstances including income, insurance, living conditions, home safety and hygiene, families, social relations, physical activities, nutrition status, expectations from Local Government. All data was computed using SPSS. Measurements were compared among themselves with correlation, while also being compared with categoric data by means of Student's t-test. Categoric values were compared among themselves by means of crosstabs.

Results:
Rate of falls was 26.6%. Number of medicines consumed were not found to be correlated with falls. Certain parameters of Quality of life questionairre were found to be associated with falls. MMSE scores were also correlated with falls history. GDS was also higher among those with insufficient social relationships (16.33 versus 12.47). This is also true for poor family relations (17.92 versus 12.11). Both conditions were significantly worsening the GDS ($p<0.0001$). Defective social relationships have been found to be associated with poorer quality of life scores too. Female subjects were found to have some handicaps compared to males, linear regression analysis has been made with different models. Given the GDS as a dependent variable, female sex -and in another regression group, poor income($p=0.009$)- was found to be associated with higher GDS scores ($p=0.028$) and falls ($p=0.003$).

Conclusion:
These findings aresupport the finding that the elderly, with history of falls were somewhat more exposed to socio-psychological inconveniences. During primary care practice, falling elderly must be regarded as a high risk group for further deterioration. Comprehensive geriatric assessment needs to be be widespread in the primary care settings in order to achieve early detection of geriatric syndromes and to offer individualised preventive approached for senior citizens.

Introduction

Background:

Effective planning of health services depends on properly determining the risk factors. With the collaboration of state and non-governmental organisations; we tried to develop a pilot project of health and social services in the municipality for the elderly according to the requirements and demands of 65+ residents of a district. A cross-sectional study was planned and applied to the elderly

who live in the Fatih Veledikarabas district of Istanbul.

The aim was:

To define the social and economic concerns, health behaviours and their interactions with life quality measurments among citizens in Istanbul, of age 65+.

To determine the risks and requirements.

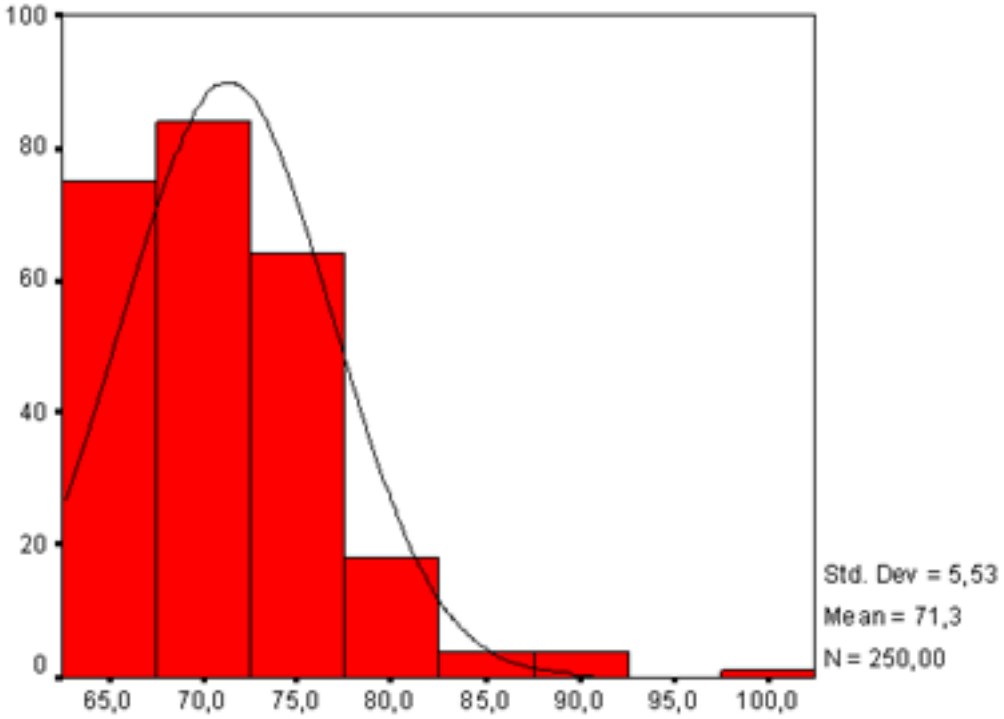
To develop effective, affordable and accessible elderly care by municipality services.

Materials & Method:

A district (Fatih Veledi Karabas district) was assigned in Istanbul. All contacted inhabitants who were sixty-five years old or more were included. The study group which consists of 250 seniors included 159 female (63.6%) and 91 male (36.4%) subjects (Table 1). After preparation of query documents in collaboration with Istanbul University and training of the staff, all subjects were visited at home. In addition to demographic data and detailed medical history, Activities of Daily Living scales (ADL and IADL), Health Related Quality Of Life Questionnaire Short Form 36 (SF 36), Mini Mental State Examination (MMSE) and Geriatric Depression Scale (GDS) were also performed for all subjects. Daily medicine consumptions (DMC) were also documented. Additionally , research was conducted pertaining to self evaluation of their social and economic circumctances including income, insurance, living conditions, home safety and hygiene, families, social relations, physical activities, nutrition status, expectations from Local Government. Emerged social and/or medical problems have been solved by municipality services during the study. All data was computed using SPSS. Measurements were compared among themselves with correlation while being compared with categoric data by means of Student's t-test. Categoric values were compared among themselves by means of crosstabs.

Table 1: Age dispersion According to sex

Results:



Mean age of the study group was 71,3 (SD=5,53) years. The age histogram was shown in Graphic 1. Population of the district was 11000. Out of the 550 registered elderly, only 250 could be reached. Subjects with Geriatric Depression Scores above fourteen numbered 129 (51.6) %). Cognitive dysfunction was suspected in subjects who achieved less than 26 points on MMSE. This was 115 subjects (46%). But not all these subjects needed psychiatric intervention. After re-evaluation by the family physician, 43 elderly have been referred to Dr. I B K. Only 13 had a psychiatric diagnosis and treatment was prescribed. There was a rather high rate of illiteracy (59%). The rate of those who were on medicines was 26%.

Rate of falls was 26,6% while there were several conditions that higher rates are associated with (Tables 1 to 5). Number of medicines consumed were not found to be correlated with falls. Certain parameters of SF 36 were found to be associated with falls. MMSE and GDS scores were also correlated with falls history; but only the latter was statistically significant. GDS was also

higher among those with insufficient social relations as well as poor family relations (Table 6). Both conditions significantly worsened the GDS ($p<0.0001$). Defective social relationships have been found associated with poorer quality of life scores too (Table 7).

Family relations were found to be associated with quality of life scores also. Those with sufficient family relations have higher:
Bodily pain (BP),
Physical functioning (PF),
Role-social (RS),
Vitality (VT),
General health (GH),
Social functioning (SF),
Role-Emotional (RE), and
Mental Health (MH)scores ($p=0,022$ for the BP, and $p=0,0001$ for the others).

As female subjects were found to have some handicaps compared to males, linear regression analysis has been made with different models. Given the GDS as a dependent variable, female sex, and in another regression group, poor income, was found to be associated with higher GDS scores and falls (female sex and GDS: $p=0.028$, poor income and GDS: $p=0.009$, female sex and falls: $p=0.003$)

Table 2. Gender and falls (p=0,25)

Table 2. Gender and falls (p=0,25)

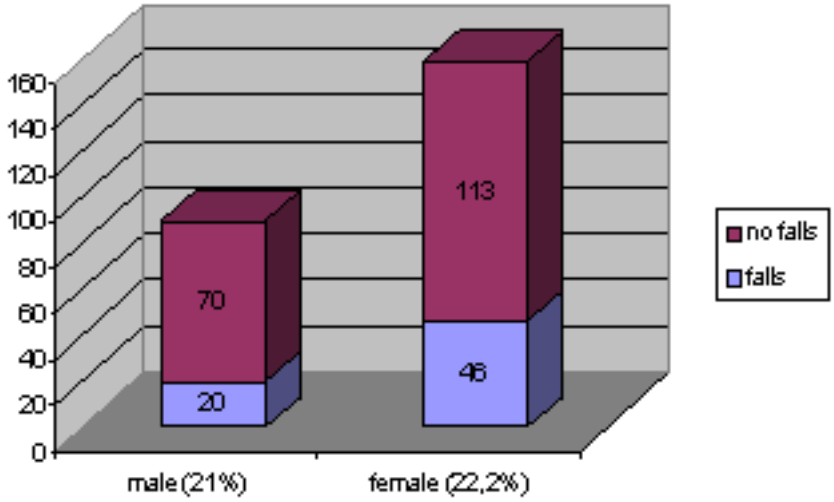


Table 3. Education and falls (p=0,007)

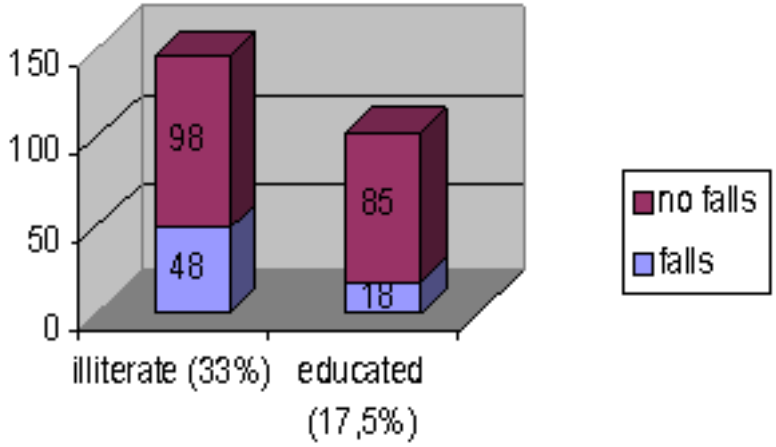


Table 4. Social insurance and falls (p=0,002)

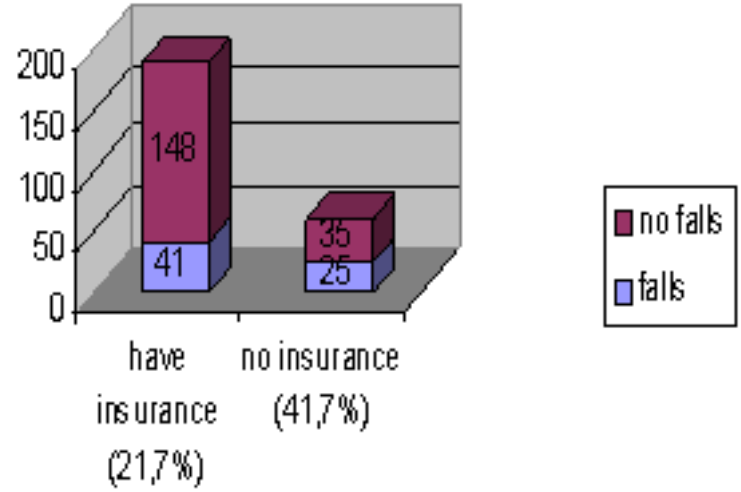


Table 5. Self-indulgence and falls (p=0,09)

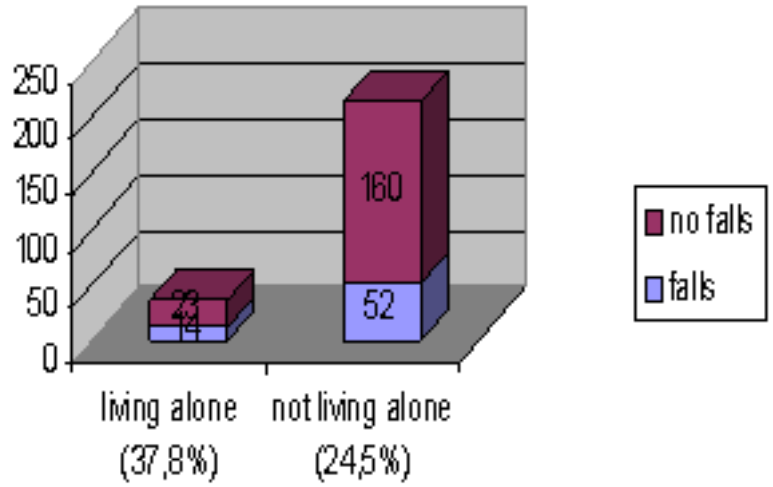
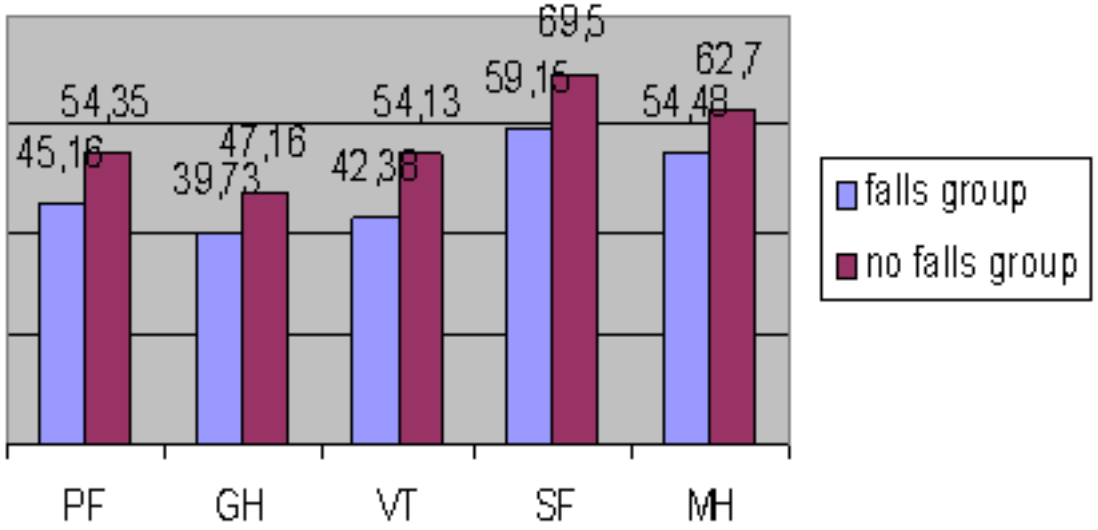


Table 6. GDS and falls, social and family relations (**)



(**): p<0,0001 for all

Table 7: SF 36 scores and falls (*)



(*):Physical functioning (pf): p=0,03

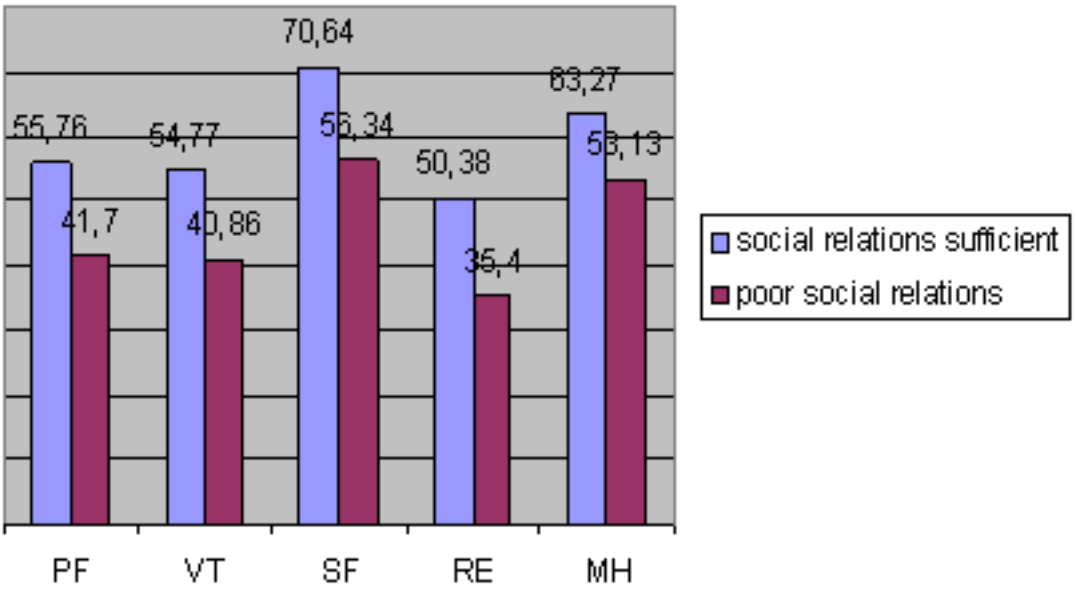
General health (gh): p=0,026

Vitality (vt) p<0,0001

Social functioning (sf) p=0,017

Mental health (mh) p<0,0001

Table 8. SF 36 and social relations (***)



(***): Physical functioning (PF) p=0,001

Vitality (VT) p<0,001

Social functioning (SF) p=0,01

Role-Emotional (RE) p=0,022

Mental Health (MH) p<0,001

Discussion and conclusion:

Falls are a marker of frailty, immobility, and acute and chronic health impairment in older persons. By age 85, approximately two-thirds of all reported injury-related deaths are due to falls. Prevention of falls must span the spectrum of ages and health states within the older population and address the diversity of causes of falls without unnecessarily compromising quality of life and independence[1].

In the United States, National Health Interview Survey's 1984 Supplement on Aging has indicated that the rate of those who report falls in the previous year and who were 65-69 years was 18% for women and 15% for men. That ratio became 27% for women and 20% for men in the age interval of 80-84, and 29% for women and 26% for men among 85+ elderly. In addition to age and female sex, there is also strong evidence that depression and mobility impairment were associated with falls[1]. In a study made in the capital of Turkey, in addition to being older than 65 years; gender was determined as a risk factor for falls in logistic regression analysis[2]. Those findings are consistent with ours.

Depression and anxiety lead to a serious impairment of daily functioning and quality of life. In frail elderly, the effects of depression and anxiety are especially deep and encroaching. Besides a deleterious effect on daily functioning and quality of life, a large number of studies demonstrate excess mortality, disability, handicap and service utilisation[3]. The Study of Osteoporotic Fractures suggests that depressive symptoms as assessed by the Geriatric Depression Scale (GDS) are a significant risk factor not only for falls but also for fractures in older Caucasian women[4]. In this study, GDS were found to be associated with falls and poorer social and family relations.

Findings obtained in this study are supporting the supposition that elderly with a history of falls were somewhat more exposed to socio-psychological inconveniences. During the primary care practices, falling elderly must be regarded as a high risk group of further deterioration. Depression, especially subsendromal types must be detected in first line health services for the elderly.

Geriatric assessment in rehabilitation and inpatient settings has demonstrated effectiveness in prolonging survival and reducing hospital and nursing home admissions; there is also some evidence it may improve functional status and prevent falls[1]. Comprehensive geriatric assesment must be implicated widespread in the primary care settings in order to achieve early detection of the geriatric syndromes and to offer individualised preventive approach for senior citizens. Further studies are necessary to determine the risks for female sex.

References

1. The Second Fifty Years: Promoting Health and Preventing Disability (1992) Institute of Medicine (IOM) can be accessed by:

http://darwin.nap.edu/books/0309046815/html/263.html.

2. Karatas G K, Mareal I. Fall Frequency In 6 Months Period and Risk Factors For Fall in Geriatric Population Living in Ankara-Gölbasi district. Turkish Journal of Geriatrics 4 (4): 152-158,2001.
3. Veer-Tazelaar N, Marwijk H, Oppen P, Nijpels G, Hout H, Cuijpers P, Stalman W, and Beekman A. Prevention of anxiety and depression in the age group of 75 years and over: a randomised controlled trial testing the feasibility and effectiveness of a generic stepped care programme among elderly community residents at high risk of developing anxiety and depression versus usual care BMC Public Health 2006, 6:186.
4. Whooley MA, Kip KE, Cauley JA, et al. Depression, falls and risk of fracture in older women: Study of Osteoporotic Fractures Research Group. Arch Intern Med 1999;159:484-490.

Original Contribution/Clinical Investigation

Age, Age at Marriage, Age Difference between Spouses and Women Empowerment: Bangladesh Context

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ABSTRACT

Women's empowerment has during the last decade become a panacea for Third World development. This paper is divided into two major parts. The first part considers the construction of women's empowerment index and the second is an endeavor to study the plausible relationship among women's empowerment and age related variables like age, age at marriage, age difference between spouses etc. The study expresses that there prevails an unsatisfactory women's empowerment situation in Bangladesh. This study also depicts that the empowerment of women increases with age and age at marriage of women. The study also reveals that there is lower empowerment for the women with a big age difference with thewith husband than the women with a smaller age difference.

Introduction

Women's empowerment is a matter of basic human rights. Interest in women's empowerment among demographers and population policy makers was heightened during the 1994 International Conference on Population and Development (ICPD) held in Cairo, at which the empowerment of women was legitimated as a social goal and enshrined as a necessary condition for population stabilization (Hodgson and Watkins 1997). Since then, critiques of demographers' views of gender and women (Presser 1997; Watkins 1993) have grown apace with the wealth of empirical studies investigating women's empowerment and its demographic consequences (Amin et al. 1994; Balk 1994, 1997; Chowdhury and Trovato 1994; Dharmalingam and Morgan 1996; Greenhalgh and Li 1995; Jejeebhoy 1995; Kritz ans Makinwa-Adebusoye 1995; Malhotra, Vanneman, and Kishor 1995; Morgan and Niraula 1995; Schuler and Hashemi 1994). The World Bank has identified empowerment as one of the key constituent elements of poverty reduction, and as a primary development assistance goal (World Bank, 2001a). Empowerment has been used to represent a wide range of concepts and to describe a proliferation of outcomes. The term has been used more often to advocate for certain types of policies and intervention strategies than to analyze them, as demonstrated by a number of documents from the United Nations (UNDAW 2001; UNICEF 1999).

The empowerment of women is an essential precondition for the elimination of world poverty and the upholding of human rights (DFID, 2000:8). Keller and Mbwewe (1991) describe women's empowerment as "a process whereby women become able to organize themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources which will assist in challenging and eliminating their own subordination". According to ICPD there are five components of women's empowerment: 1) women's sense of self worth 2) their right to determine choices 3) their right to have access to opportunities and resources 4) their right to have the power to control their own lives, both within and outside the home and 5) their ability to influence the direction of social change to create a more just social and economic order, nationally and internationally. Hashemi and Schuler (1993) defined the empowerment of women through the use of six spheres: 1) sense of self and a vision of the future, including resisting negative behaviors of the husband; 2) mobility and visibility, including how women are treated when they are traveling; 3) economic security, including cash income, new skills and knowledge; 4) status and decision-making power within the household, including making purchases on their own; 5) ability to interact effectively in the public sphere, such as joining credit programs, and 6) participation in non-family groups, such as credit programs and solidarity movements.

It is recognized that women work more hours than men particularly in low-income households, more in agricultural than in non-agricultural economic activities, and more as unpaid family laborers than as managers. Even if they do most of the work, men mostly control the decision-making power and ownership of household resources. Garcia and de Oliveira (2001) found that women are highly dependent and have little or no power of decision, or are limited to some badly appreciated domestic duties. The World Bank study in Bangladesh highlights that women have a limited role in household decision-making, limited access and control over household resources (physical and financial assets), low level of individual assets, heavy domestic workloads, restricted mobility and inadequate knowledge and skills that lead to women's vulnerability (Sebstad and Cohen 2002:44). In developing countries like Bangladesh age related variables like age, age at marriage, age difference between spouses etc. affect women's empowerment. Recently, a number of empirical studies have explored the effects of socio-economic characteristics of individuals such as age and education on empowerment of women (Morin & Suarez, 1983; Bellate & Saba, 1986; Riley & Chow, 1992).

Data Source

The data used in this study are taken from Bangladesh Demographic and Health Survey (BDHS - 2004) (Mitra and Associates, 2005) a nationally representative survey of 11,440 women of age 10-49 which was conducted under the authority of the National Institute for Population Research and Training (NIPORT) over a five month period from 1 January to 25 May 2004 using multistage cluster sampling.

Construction of Index

Women's empowerment is multidimensional and is very difficult to measure. It comprises the entire complex of interactions, roles, rights and statuses that surround being male versus being female in a given society or culture (Mason, 1997). However, in our study we have tried to measure women's empowerment in the domestic sphere by making a women empowerment index using the dimensions in accordance with Mason and Smith (2003). The particular aspects or dimensions of domestic empowerment we take are:

1. Women's economic decision-making power.
2. Their household decision-making power.

3. Their physical freedom of movement.

The detailed description of these three dimensions with their relevant indicators is given in Table 1. Then the index of each dimension was constructed where minimum and maximum values were chosen for each underlying indicator. Performance in each indicator is expressed as the minimum and maximum value between 0 and 1 in accordance with the construction method of the Human Development Index (UNDP, 2005) as follows:

$$IVij = \frac{(Xij) - Min(Xij)}{Max(Xij) - Min(Xij)}$$

Where, (Xij), Min (Xij), Max (Xij) and IVij are, respectively, the actual, minimum, maximum and dimension index.

The Women Empowerment Index (WEI) is then computed in a simple average of these three indices according to the formula below:

WEI = 1/3(economic decision making index) + 1/3 (household decision making index) + 1/3 (freedom of movement index).

Goals

The main objectives of the study are:

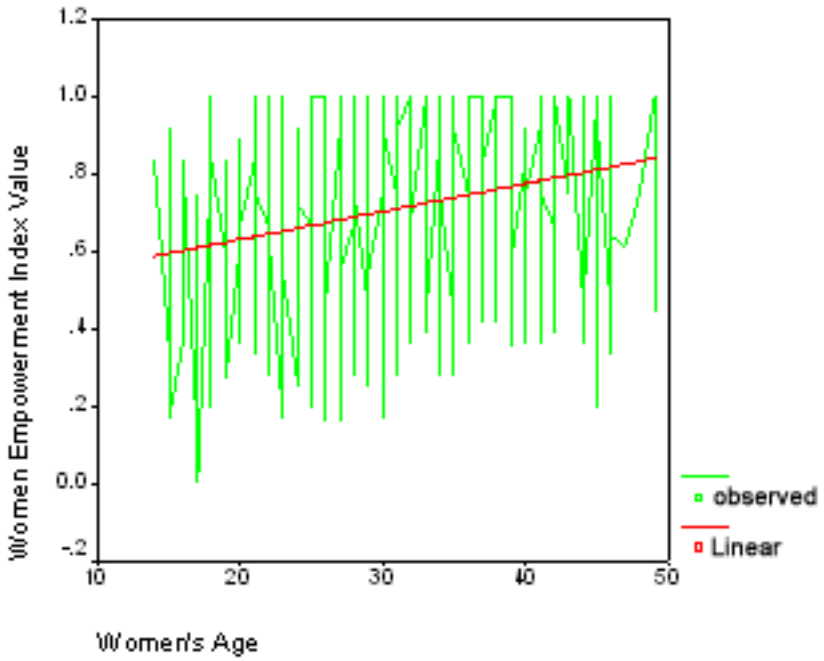
- to construct the women empowerment index; and
- to explore empirically the links between women empowerment and such socio-demographic variables as age, age at marriage, age difference between spouses, educational attainment etc. in Bangladesh.

Empirical Results and Discussion

Women Empowerment and Demographic Variables: Until recently, the surveys used to study demographic and other development phenomena rarely included relatively direct measures of women's empowerment of the kind used here. Analysts were therefore forced to rely on proxy measures. Among the most commonly used proxies were women's age, age at first marriage or first union, the age difference between husband and wife, women's education and their employment status (Mason 1986). Table 2 provides the mean score of WEI and some selected demographic variables.

In Figure 1, we plotted the women empowerment index value by the respondent's current age which depicts that the empowerment of women increases as age of women increases. We also observed from Table 2 that there is an upward trend in the mean score in the women empowerment index. That is, on average the women who are under 20 years of age are much less empowered than the women who are above 35 years of age. One impediment that a woman faces is the usual norm of early marriage which implies arranged marriages or forced marriages where a woman has no right to choose her marriage partner, infringing on her sexual and reproductive rights. Early marriage usually leads to early motherhood and young women are often threatened by death due to pregnancy-related causes. We also observe from Table 2 that the women who marry earlier (<15 years) are also less empowered than those who marry at older ages (after 20 years). Conclusions to be drawn from this observation is that early marriages for women result in dropping out of school and losing opportunities

Figure 1. Graphical Representation of WEI by age



for economic activities and thereafter less empowerment. The age difference between spouses in Bangladesh is usually big, thus girls most often get married off to men who are considerably older than themselves, and also early motherhood is common here. The result expresses that the women having little age gap with the husband are more empowered than other women.

Table 1: Description of dimensions and indicators with their measurement

No.	Component	Description	Coding	Measurement Scale
1.	Economic Decision Making index	Who decides how to spend money	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else	1,2,3 = 1 4,5 = 0
		Final say on large household purchases	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable	1,2,3 = 1 4,5,6 = 0
		Final say on making household purchases for daily needs	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable	1,2,3 = 1 4,5,6 = 0
2.	Household decision making index	Final say on own health care	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable	1,2,3 = 1 4,5,6 = 0
		Final say on child health care	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable 7=Not applicable/no child	1,2,3 = 1 4,5,6,7 = 0
		Final say on food to be cooked each day	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable	1,2,3 = 1 4,5,6 = 0
		Discussed about family planning with partner	1=Mainly respondent 2=Mainly husband 3=Joint decision 4=Others	1,3 = 1 2,6 = 0

Table 1: Description of dimensions and indicators with their measurement

No.	Component	Description	Coding	Measurement Scale
3.	Freedom of movement index	Final say on visits to family or relatives	1=Respondent alone 2=Respondent and husband/partner 3=Respondent and other person 4=Husband/partner alone 5=Someone else 6=Decision not made/not applicable	1,2,3 = 1 4,5,6 = 0
		Goes outside the village/town/city alone	0=No 1=Alone 2=With children 6=Others	1 = 1 0,2,6 = 0
		Goes to a health centre or hospital alone	0=No 1=Alone 2=With children 3=With husband 6=Others	1 = 1 2,3,6 = 0
		Goes shopping alone or with somebody else	1=Alone 2=With children 3=With husband 4=With relatives	1 = 1 2,3,4 = 0

Table 2: Mean score of WEI by selected demographic variables

Variables	Mean Score of WEI	Number of Cases	Percentage
Age			
<20	0.5178	39	6.1
20-35	0.6976	430	67.0
35+	0.7678	173	26.9
Age at first marriage			
<15	0.6878	320	49.8
15-16	0.7023	159	24.8
17-19	0.7342	88	13.7
20+	0.7552	75	11.7
Age difference between spouses			
Little (Up to 5 years)	0.7275	170	26.5
Moderate (6-10 years)	0.6864	271	42.2
Big (>10 years)	0.7130	201	31.3
Total	0.7056	642	100.0

Women Empowerment and Educational Qualifications : Education is often argued to increase women's empowerment by increasing their self-confidence and understanding of how to operate in the world (Cochrane 1979). In addition, one of the most important products of education, literacy, is said to increase women's independence from other family members by giving them the means to learn about the outside world on their own (Jejeebhoy 1995). Education has also been argued to enhance women's value in the labor market and hence their income, which in turn is said to decrease their dependency on other family members and hence increase their empowerment (Cochrane 1979, Safilios-Rothschild 1980). Several studies have reported that educational attainment is positively related to women empowerment. Table 3 provides the mean score of WEI by educational qualification of women and their husbands.

From Table 3 we observe that the educational qualification, both for husband and wife affects women empowerment significantly. The result reveals that the mean score of empowerment for women who have higher education (0.7888) is higher than other groups and also this is same for women whose husbands have higher education (0.7674). Conclusions can be drawn here that more education contributes to the fundamental process of women's empowerment.

Table 3: Mean score of WEI by educational qualification

Variables	Mean Score of WEI	Number of Cases	Percentage
Educational Qualification			
Illiterate	0.7052	251	39.1
Primary	0.6816	165	25.7
Secondary	0.6835	140	21.8
Higher	0.7888	86	13.4
Husband's Educational Qualification			
Illiterate	0.6982	249	38.8
Primary	0.6727	147	22.9
Secondary	0.7074	142	22.1
Higher	0.7674	104	16.2
Total	0.7056	642	100.0

Women Empowerment and socio-economic variables: There are several other quantitative and qualitative factors which could contribute to women's empowerment, particularly qualitative ones, for instance, place of residence, socio-economic status, religious belief etc. which are shown in Table 4.

Table 4: Mean score of WEI by selected socio-economic variables

Variables	Mean Score of WEI	Number of Cases	Percentage
Place of Residence			
Rural	0.6790	320	49.8
Urban	0.7321	322	50.2
Socio-Economic Status			
Poor	0.6815	224	34.9
Middle	0.6771	96	15.0
Rich	0.7308	322	50.2
Religion			
Non-Muslim	0.7335	64	10.0
Muslim	0.7025	578	90.0
Total	0.7056	642	100.0

We observe that urban women are more empowered than their rural counterparts. The rich women are more empowered than other women. It also shows the higher empowerment of poor women than middle class women. The cause may be the poor women become bound to defy the customary social barrier to earn to support their family. In Bangladesh women in the Muslim communities have far lower decision-making power and freedom than women in the non-Muslim community. Thus religion is often important for women's empowerment (Jejeebhoy and Sathar 2001; Mason et al. 2002). Our study also shows that Muslim women are less empowered.

Conclusion

Empowerment of women is not a thing but a process. It has several dimensions and not all dimensions rise and fall together; a single variable such as age at marriage or education cannot logically index all aspects of female empowerment equally well. Based on empirical results and discussion, the overall conclusion of this study is that the level of women's empowerment in Bangladesh is not satisfactory for any of the age groups. Older women have more independence and empowerment than younger women because they have more experience with life, a better understanding of how to get what they want or need, a closer relationship with the husband, or because they have fulfilled certain social obligations to the husband and his family (for example, bearing children or sons) and thus are more trusted than are young wives, over whom tighter controls are maintained.

In much of the developing world, especially in Bangladesh adolescent and child marriage continues to be a strong social norm, particularly for girls. Early female marriage is associated with a number of poor social and physical outcomes for young women. On average, girls who marry as adolescents attain lower schooling levels, which cause lower self confidence, bargaining power, freedom of choices etc. as a result they have less reproductive control and suffer higher rates of maternal mortality and domestic violence and thereafter less empowerment. It is also seen that women with smaller age difference with their husbands are more empowered. It may be due to the fact that if the age difference is little there will have better understanding between husbands and wives and eventually, women's participation in decision-making will increase and the pace of domestic violence will decrease.

Since the empowerment of women is an essential precondition for the elimination of world poverty and the upholding of human rights, the government of Bangladesh should enforce the existing law of minimum age at marriage (18 years). They should take pragmatic steps to increase level of education for both males and females. Also awareness about women's right i.e. fundamental needs, should be increased through the mass media.

References

1. Amin, Ruhul, A. U. Ahmed, J. Chowdhury, and M. Ahmed. "Poor Women's Participation in Income-Generating Projects and Their Fertility Regulation in Rural Bangladesh: Evidence from a Recent Survey." World Development, 1994; 44:555-65.

2. Balk, Deborah. "Individual and Community Aspects of Women's Status and Fertility in Rural Bangladesh." Population Studies, 1994; 48(March):21-45.

3. -----"Defying Gender Norms in Rural Bangladesh: A Social Demographic Analysis." Population Studies, 1997; 51(July):153-72.

4. Bellante, D. & Saba, R. "Human Capital and Life-Cycle Effects on Risk aversion." 1986.

5. Bennett, Lynn. "Using Empowerment and Social Inclusion for Pro-poor Growth: A Theory of Social Change. Working Draft of Background Paper for the Social Development Strategy Paper. Washington, DC: World Bank, 2002.

6. Chowdhury, Fakhrul I. and Frank Trovato. "The Role and Status of Women and the Timing of Marriage in Five Asian countries." Journal of Comparative Family Studies, 1994; 25:143-57.

7. Cochrane, Susan Hill. Fertility and Education: What Do We Really Know? Baltimore, MD: Johns Hopkins University Press, 1979.

8. DFID "Report on Poverty Alleviation and the Empowerment of

women, UK: Stairway Communications", 2000.

9. Dharmalingam, A. and S. Philip Morgan. "Women's Work, Empowerment, and Birth Control: Evidence from Two South Indian Villages." Population Studies, 1996; 50:187-201.

10. Garcia, B., and O. de Oliveira "Fatherhood among middle and low income sectors of Urban Mexico." IUSSP, XXIV General Population Conference, Salvador, Brazil, 18-24 August 2001.

11. Greenhalgh, Susan and Jiali Li. "Engendering reproductive policy and practice in peasant China: For a feminist demography of reproduction." Signs: Journal of Women in Culture and Society, 1995; 20:601-41.

12. Hashemi, Syed M. and Sidney Ruth Schuler "Defining and Studying Empowerment of Women: A Research Note from Bangladesh." JSI Working Paper No. 3. Washington DC: John Snow, Inc. 1993.

13. Hodgson, Dennis and Susan Cotts Watkins. "Feminists and Neo-Malthusians: Past and Present Alliances." Population and Development Review, 1997; 23(3):469-523.

14. Jejeebhoy, Shireen J. Women's Education, Empowerment, and Reproductive Behaviour: Experience from Developing Countries. Oxford: Clarendon Press, 1995.

15. Jejeebhoy, Shireen J. and Zeba Ayesha Sathar. "Women's Autonomy in India and Pakistan: The Influence of Religion and Region." Population and Development Review, 2001; 27(4): 687-712.

16. Keller, B. and D.C. Mbwewe "Policy and planning for the empowerment of Zambia's women farmers." Canadian Journal of Development Studies, 1991; 12(1):75-88.

17. Kishor, Sunita "Empowerment and Egyptian Women: Findings from the 1988 Egypt Demographic and Health Survey." Calverton, Md: Macro International Inc. 1995.

18. Kritz, Mary M. and Paulina Makinwa. "Women's Control Over Resources and Demand for Children: The Hausa and Yoruba Cases." Pp. 73-97 in Women's Position and Demographic Change in Sub-Saharan Africa, edited by Paulina Makinwa and Ann-Magritt Jensen. Liege, Belgium: International Union for the Scientific Study of Population, 1995.

19. Malhotra, Anju, Reeve Vanneman, and Sunita Kishor. "Fertility, Dimensions of Patriarchy, and Development in India." Population and Development Review, 1995; 21:281-305.

20. Mason, Karen Oppenheim. "The Status of Women: Conceptual and Methodological Issues in Demographic Studies." Sociological Forum, 1986; 1(2):284-300.

21. Mason, K.O. "Gender and Demographic Change: What do we know? In The Continuing Demographic Transition, G.W. Jones and others, eds. Oxford: Clarendon Press, 1997: 158-182.

22. Mason, Karen Oppenheim, Herbert L. Smith, Angela Stach and S. Philip Morgan. "Muslim Women in Southeast Asia: Do They Have Less Autonomy Than Their Non-Muslim Sisters?" World Bank, unpublished manuscript, 2002.

23. Mason, Karen Oppenheim and Smith "Women's Empowerment and Social Context: Result from Five Asian Countries", 2003.

24. Mitra and Associates. Bangladesh Demographic and Health Survey (BDHS-2004) Dhaka, Bangladesh and Calverton, Maryland [USA]: National Institute of Population Research and Training, Mitra and Associates, and ORC Macro, 2005.

25. Morgan, S. Philip and Banu Niraula. "Gender Inequality and Fertility in Two Nepali Villages." Population and Development Review, 1995: 21:541-61.

26. Morin R.A. & Suarez, F. "Risk aversion revisited." Journal of Finance, 1983; 38: 1201-1216.

27. Presser, Harriet B. "Demography, Feminism, and the Science-Policy Nexus." Population and Development Review, 1997: 23(2):295-331.

28. Riley, W.B. & Chow, K.V. "Asset Allocation and Individual risk aversion." Financial Analysis Journal, 1992; 48(6), 32-37.

29. Rowlands, Jo. "Empowerment examined." Development in Practice 1995; 5(2): 101-107.

30. Safilios-Rothschild, Constantina. "A Class and Sex Stratification Theoretical Model and its Relevance for Fertility Trends in the Developing World." In Determinants of Fertility Trends: Theories Re-Examined, edited by Charlotte Holn and Ranier Machensen. Liege: Ordina Editions, 1980.

31. Schuler, Sidney Ruth and Syed M. Hashemi. "Credit Programs, Women's Empowerment, and Contraceptive Use in Rural Bangladesh." Studies in Family Planning, 1994; 25:65-76.

32. Sebstad and Cohen "Microfinance, Risk Management, and Poverty." AIMS Paper, Management Systems International, Washington, D.C. 2002.

33. United Nations Children's Fund (UNICEF) "Human rights for children and women: How UNICEF helps make them a reality. Available online at http://www.unicef.org./pubsgen/humanrights-children/index.html, 1999.

34. UN Division for the Advancement of Women (UNDAW), Department of Economic and Social Affairs. "Empowerment of Women throughout the Life Cycle as a Transformative Strategy for Poverty Eradication. Report of the Expert Group Meeting, 26-29 New Delhi, India ,November, 2001.

35. United Nations Development Programme (UNDP) "Human Development Report 2005, United Nations Development Programme, New York, 2005.

36. Watkins, Susan Cotts. "If All We Knew About Women Was What We Read in Demography, What Would We Know?" Demography, 1993; 30(4):551-77.

37. World Bank "Engendering Development: Through Gender Equality in Rights, Resources, and Voice. World Bank Policy Research Report. Oxford: Oxford University Press, 2001a.

Review Articles

Breaking Points of Life for Major Health Problems

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ABSTRACT

Background: Aging alone may be one of the major disorders of human beings.

Methods: Patients at and above the age of 20 years were included to check weight.

Results: The study included 1068 cases in total (of whom 628 were females). Due to the small number of cases in the ninth decade, 20 cases only, they were not included for statistical comparison. There were only 19 (1.7%) cases with underweight and 307 (28.7%) with normal weight, so 69.4% (742) of cases at and above the age of 20 years had excess weight. Prevalences of hyperbetalipoproteinemia, hypertriglyceridemia, dyslipidemia, and excess weight showed their most significant progressions in the fourth decade of life ($p<0.001$ for all). Diabetes mellitus (DM) showed its most significant progression in the fifth ($p<0.001$), and hypertension (HT) and coronary heart diseae (CHD) in the sixth decades of life ($p<0.001$). Interestingly, although all of the disorders continuously increased in prevalence by decades, the prevalence of excess weight decreased in the eighth decade parallel to the decreasing prevalences of hyperbetalipoproteinemia, hypertriglyceridemia, and dyslipidemia, significantly ($p<0.05$ for all).

Conclusion: Aging may be one of the major disorders of human being, particularly in the presence of excess weight, and probably there are some breaking points of life for dyslipidemia, excess weight, DM, HT, and CHD with this order, and dyslipidemia may be a pioneer sign of excess weight.

Key words: Excess weight, dyslipidemia, diabetes mellitus, hypertension, coronary heart disease.

INTRODUCTION

Aging alone may be one of the major disorders of human beings since it comes with many associated disorders. First of all, it has been reported in many studies that aging is strongly associated with weight excess[1,2]. Secondly, chronic inflammation is frequently observed with aging, and is considered as a major risk factor for age-related chronic disorders such as atherosclerosis, hypertension (HT), type 2 diabetes mellitus (DM), and cancers [3-5]. The chronic inflammatory status is characterized by increased circulatory levels of inflammatory parameters, such as tumor necrosis factor-alpha, interleukin-6, and C-reactive protein, and there is a close relationship between these inflammatory parameters and insulin sensitivity, so prevalence of glucose intolerance increases with age[6]. The insulin resistance may also be involved in age-related muscular loss since its anabolic action is essential for protein gain. For example, insulin deficiency as in type 1 DM is associated with a rapid and major muscular loss[7]. Beside that many structural and functional modifications occur in skeletal muscle during aging, and these defects lead to the impairment in muscular strength, contractile capacity, and performance[8,9]. Similarly, the human heart undergoes many functional changes with advancing age, including increased prevalence of rhythmic abnormalities, decreases in myocyte numbers, accumulation of collagen and fibrosis, and decreases in stress-induced cardiac function, all of which cause an age-related increase in the risk of coronary heart disease (CHD) and other cardiac

pathologies**(10)**. We tried to understand here of there are or not some breaking points of aging for excess weight, DM, HT, dyslipidemia, and CHD-like major health problems.

MATERIAL and METHODS

The study was performed in the Internal Medicine Polyclinic of the Dumlupinar and Mustafa Kemal Universities on routine check up patients between August 2006 and September 2007. Consecutive patients at and above the age of 20 years were taken into the study to permit growth of weight in youngers. Their medical histories including smoking habits, HT, DM, dyslipidemia, and already used medications were learnt, and a routine check up procedure including fasting plasma glucose (FPG), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), and an electrocardiography was performed. Current daily smokers, at least for a period of last 12 months, and cases with a history of at least five packs/years smoked, were included as smokers. Patients with devastating illnesses, including type 1 DM, malignancies, acute or chronic renal failure, chronic liver diseases, hyper- or hypothyroidism, and heart failure were excluded to avoid their possible effects on weight. Body mass index (BMI) of each case was calculated by the measurements of the same physician in stead of verbal expressions. Weight in kilograms is divided by height in meters squared, and underweight is defined as a BMI of lower than 18.5, normal weight as 18.5-24.9, overweight as 25.0-29.9, and obesity as a BMI of 30.0 $kg/m^{(2)}$ or greater[11]. Cases with an overnight FPG level of 126 mg/dL or greater on two occasions or already taking anti-diabetic medications were defined as diabetics[11]. An oral glucose tolerance test with 75-gram glucose was performed in cases with a FPG level between 110 and 126 mg/dL, and diagnosis of cases with a 2-hour plasma glucose level 200 mg/dL or higher is DM[1]. Additionally patients with dyslipidemia were detected, and we used the National Cholesterol Education Program Expert Panel's recommendations for defining dyslipidemic subgroups[11]. Dyslipidemia is diagnosed when LDL-C is 160 or higher and/or TG is 200 or higher and/or HDL-C is lower than 40 mg/dL. Office blood pressure was checked after a 5 minute rest in seated position with a mercury sphygmomanometer on three visits, and no smoking was permitted during the previous 2-hours. A 10-day twice daily measurement of blood pressure at home (HBP) was obtained in all cases, even in normotensives in the office due to the risk of masked HT after 10-minutes of education about proper BP measurement techniques[12]. The education included recommendation of upper arm while discouraging wrist and finger devices, using a standard adult cuff with bladder sizes of 12 x 26 cm for arm circumferences up to 33 cm in length and a large adult cuff with bladder sizes of 12 x 40 cm for arm circumferences up to 50 cm in length, and taking a rest at least for a period of 5-minute in the seated position before measurement. An additional 24-hour ambulatory blood pressure monitoring (ABP) was not required due to the equal efficacy of the method with HBP measurement to diagnose HT[13]. Eventually, HT is defined as a BP of 135/85 mmHg or greater on HBP measurements[12]. A stress electrocardiography was performed in suspected cases, and a coronary angiography was obtained only for the stress electrocardiography positive cases. Eventually, number of cases in each decade was detected, and prevalence of smoking, excess weight, hyperbetalipoproteinemia, hypertriglyceridemia, dyslipidemia, DM, HT, and CHD were compared between the decades. Comparison of proportions was used as the method of statistical analysis.

RESULTS

The study included 1068 cases (628 females and 440 males) totally. Due to the small number of cases in the ninth decade, 20 cases only, they were not included for statistical comparison. There were only 19 (1.7%) cases with underweight and 307 (28.7%) with normal weight, and a very high prevalence 69.4% (742) of cases at and above the age of 20 years had excess weight. When we looked at the prevalence of the above disorders, prevalence of excess weight, hyperbetalipoproteinemia, hypertriglyceridemia, and dyslipidemia showed their most significant progressions in the fourth decade of life ($p<0.001$ for all). One decade later, DM showed its most significant progression ($p<0.001$), and two decades later, HT and CHD showed their greatest progressions ($p<0.001$). So there was a stepwise progression initiating from dyslipidemia and excess weight and terminating with HT and CHD. Interestingly, although all of the disorders continuously increased in prevalence by decades, the prevalence of excess weight decreased in the eighth decade of life, parallel to the decreasing prevalence of hyperbetalipoproteinemia, hypertriglyceridemia, and dyslipidemia, significantly ($p<0.05$ for all). Another interesting finding of our study, was that prevalence of smoking increased significantly ($p<0.001$) in the fourth decade parallel to the significantly increasing prevalence of excess weight again, and it remained nearly stable in the rest of life (Table 1).

Table 1: Associated disorders of the study cases

Variables	Third decade	t-test value	Fourth decade	t-test value	Fifth decade	t-test value	Sixth decade	t-test value	Sev-enth decade	t-test value	Eighth decade
Number	181		157		246		249		108		107
Prevalence of smoking	11.0% (20)	8.57 ***	32.4% (51)	ns†	28.8% (71)	ns	31.7% (79)	ns	23.1% (25)	ns	23.3% (25)
Prevalence of excess weight	28.7% (52)	9.65 ***	63.6% (100)	4.79 ***	78.4% (193)	ns	83.1% (207)	ns	87.0% (94)	2.60 *	78.5% (84)
Prevalence of hyper-betalipopro-teinemia	1.6% (3)	11.06 ***	12.7% (20)	ns	15.8% (39)	ns	19.6% (49)	ns	23.1% (25)	2.22 *	14.0% (15)
Prevalence of hy-per-triglyceridemia	5.5% (10)	5.34 ***	15.2% (24)	2.21 *	20.3% (50)	2.10 *	25.7% (64)	ns	24.0% (26)	3.08 **	11.2% (12)
Prevalence of dys-lipidemia	6.6% (12)	10.12 ***	26.7% (42)	ns	31.7% (78)	2.42 *	38.9% (97)	ns	39.8% (43)	4.06 ***	20.5% (22)
Prevalence of dia-betes mellitus	0.5% (1)	ns	1.9% (3)	11.23 ***	11.7% (29)	4.84 ***	21.6% (54)	ns	25.0% (27)	ns	26.1% (28)
Prevalence of hypertension	0.0%	3.08 **	5.0% (8)	3.88 ***	10.4% (26)	5.14 ***	20.4% (51)	2.81 **	31.4% (34)	ns	38.3% (41)
Prevalence of coro-nary heart disease	0.0%	ns	0.0%	2.41 *	3.6% (9)	7.75 ***	12.8% (32)	2.89 **	22.2% (24)	ns	24.2% (26)

*p<0.05 **p<0.01 ***p<0.001 †Nonsignificant (p>0.05)

DISCUSSION

Although aging alone may be a major disorder of human beings, all of the above disorders cannot solely be explained by aging, and probably excess weight is a major contributing factor of it. Excess weight leads to structural and functional abnormalities of body, and recent studies have revealed that adipose tissue produces biologically active leptin, tumor necrosis factor-alpha, plasminogen activator inhibitor-1, and adiponectin, which are closely related to the development of complications[14]. For example, numerous epidemiological studies have indicated that inflammation plays an important role in the pathogenesis of atherosclerosis and thrombosis in the cardiovascular system[15,16], and adipose tissue is involved in the regulation of these cytokines[17]. Additionally, individuals with excess weight have an increased circulating blood volume as well as an increased volume of cardiac output, thought to be the result of increased oxygen demand of the extra body tissue. The prolonged increase in circulating blood volume can lead to myocardial hypertrophy and decreased compliance, in addition to the common comorbidity of HT[18]. In addition to the HT, the prevalences of high FPG, high serum total cholesterol, and low HDL-C, and their clustering were all raised with increases in BMI[19]. Combination of these cardiovascular risk factors eventually leads to the increase in left ventricular stroke with a higher risk of arrhythmias, cardiac failure, and even sudden cardiac death. So the above prospective cohort study showed that elevated BMI is one of the independent risk factors for stroke and CHD[19]. Similarly, the incidences of CHD and stroke, especially ischemic stroke, have increased with an elevated BMI in other studies[20]. Eventually, the risk of death from all causes including cancers increases throughout the range of moderate and severe weight excess both for men and women in all age groups[21], so it is important in medical terms to specify the excess weight not only as a risk factor but as an obesity disease. As similar results of our study, prevalence of excess weight was 63.6% even in the fourth and it was 87.0% in the seventh decades of life. On the other hand, prevalence of excess weight showed its most significant progression in the fourth decade, parallel to the most significant progressions of hyperbetalipoproteinemia, hypertriglyceridemia, and dyslipidemia in the same decade ($p<0.001$ for all). Just one decade later, DM showed its most significant progression ($p<0.001$), and two decades later, HT and CHD showed their greatest progressions ($p<0.001$). So there was a stepwise progression initiating from dyslipidemia and excess weight and terminating with HT and CHD.

Although excess weight may be a major contributoing factor for the above disorders, it cannot be the sole

reason for all of them. As already shown in this study, the decreased prevalences of excess weight in the eighth decade, the prevalences of DM, HT, and CHD continued to increase, and their prevalence reached up to 26.1%, 38.3%, and 24.2% in the eighth decade of life. But as an interesting result of our study, although all the disorders increased in prevalence by decades, the prevalence of excess weight decreased in the eighth decade parallel to the decreasing prevalences of hyperbetalipoproteinemia, hypertriglyceridemia, and dyslipidemia, significantly ($p<0.05$ for all), indicating the pioneer sign of dyslipidemia for excess weight.

It was shown in some previous studies that smoking cessation usually leads to weight gain and changes in adipose cell metabolism, in particular increases in adipose tissue lipoprotein lipase activity[22,23]. This increase in lipoprotein lipase activity may contribute to the increase in body weight associated with smoking cessation. Also, this trend may be due to the inhibitory effect of smoking on appetite. Similar findings were seen in some other studies,[24,25]. Whereas in our study, prevalence of smoking increased significantly ($p<0.001$) in the fourth decade, parallel to the significantly increasing prevalence of excess weight, and it nearly remained stable, and did not decrease by the decreasing prevalence of excess weight in the eighth decade of life. As a similar result to ours, smokers in India constitute a greater percentage of the obese group[26]. So further studies are required about smoking and body weight.

As a conclusion, aging may be one of the major disorders of human beings, particularly in the presence of excess weight, and probably there are some breaking points of life for dyslipidemia, excess weight, DM, HT, and CHD with this order, and dyslipidemia may be a pioneer sign of excess weight.

References

1. Stene LCM, Giacaman R, Abdul-Rahim H, Husseini A, Norum KR, Holmboe-Ottesen G. Obesity and associated factors in a Palestinian West Bank village population. Eur J Clin Nutr 2001; 55: 805-811.

2. Martinez-Ros MT, Tormo MJ, Navarro C, Chirlaque MD, Perez-Flores D. Extremely high prevalence of overweight and obesity in Murcia, a Mediterranean region in south-east Spain. Int J Obes Relat Metab Disord 2001; 25: 1372-1380.

3. Ferrucci L, Penninx BW, Volpato S, Harris TB, Bandeen-Roche K, Balfour J, et al. Change in muscle strength explains accelerated decline of physical function in older women with high interleukin-6 serum levels. J Am Geriatr Soc 2002; 50: 1947-1954.

4. Pedersen M, Bruunsgaard H, Weis N, Hendel HW, Andreassen BU, Eldrup E, et al. Circulating levels of TNF-alpha and IL-6-relation to truncal fat mass and muscle mass in healthy elderly individuals and in patients with type-2 diabetes. Mech Ageing Dev 2003; 124: 495-502.

5. Visser M, Pahor M, Taaffe DR, Goodpaster BH, Simonsick EM, Newman AB, et al. Relationship of interleukin-6 and tumor necrosis factor-alpha with muscle mass and muscle strength in elderly men and women: the Health ABC Study. J Gerontol A Biol Sci Med Sci 2002; 57: 326-332.

6. Shimokata H, Muller DC, Fleg JL, Sorkin J, Ziemba AW, Andres R. Age as independent determinant of glucose tolerance. Diabetes 1991; 40: 44-51.

7. Tessari P, Biolo G, Inchiostro S, Sacca L, Nosadini R, Boscarato MT, et al. Effects of insulin on whole body and forearm leucine and KIC metabolism in type 1 diabetes. Am J Physiol 1990; 259: 96-103.

8. Nair KS. Aging muscle. Am J Clin Nutr 2005; 81: 953-963.

9. Roubenoff R, Castaneda C. Sarcopenia-understanding the dynamics of aging muscle. JAMA 2001; 286: 1230-1231

10. Lakatta EG, Levy D. Arterial and cardiac aging: major shareholders in cardiovascular disease enterprises: Part II: the aging heart in health: links to heart disease. Circulation 2003; 107: 346-354.

11. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation 2002; 17:106: 3143-3421.

12. O'Brien E, Asmar R, Beilin L, Imai Y, Mallion JM, Mancia G, et al. European Society of Hypertension recommendations for conventional, ambulatory and home blood pressure measurement. J Hypertens 2003; 21: 821-848.

13. Helvaci MR, Seyhanli M. What a high prevalence of white coat hypertension in society! Intern Med 2006; 45: 671-674.

14. Funahashi T, Nakamura T, Shimomura I, Maeda K, Kuriyama H, Takahashi M, et al. Role of adipocytokines on the pathogenesis of atherosclerosis in visceral obesity. Intern Med 1999; 38: 202-206.

15. Widlansky ME, Gokce N, Keaney JF Jr, Vita JA. The clinical implications of endothelial dysfunction. J Am Coll Cardiol 2003; 42: 1149-1160.

16. Ridker PM. High-sensitivity C-reactive protein: Potential adjunct for global risk assessment in the primary prevention of cardiovascular disease. Circulation 2001; 103: 1813-1818.

17. Yudkin JS, Stehouwer CD, Emeis JJ, Coppack SW. C-reactive protein in healthy subjects: associations with obesity, insulin resistance, and endothelial dysfunction: a potential role for cytokines originating from adipose tissue? Arterioscler Thromb Vasc Biol 1999; 19: 972-978.

18. Helvaci MR, Kaya H, Yalcin A, Kuvandik G. Prevalence of white coat hypertension in underweight and overweight subjects. Int Heart J 2007 (in press).

19. Zhou B, Wu Y, Yang J, Li Y, Zhang H, Zhao L. Overweight is an independent risk factor for cardiovascular disease in Chinese populations. Obes Rev 2002; 3: 147-156.

20. Zhou BF. Effect of body mass index on all-cause mortality and incidence of cardiovascular diseases--report for meta-analysis of prospective studies open optimal cut-off points of body mass index in Chinese adults. Biomed Environ Sci 2002; 15: 245-252.

21. Calle EE, Thun MJ, Petrelli JM, Rodriguez C, Heath CW Jr. Body-mass index and mortality in a prospective cohort of U.S. adults. N Engl J Med 1999; 341: 1097-1105.

22. Owen-Smith V, Hannaford PC. Stopping smoking and body weight in women living in the United Kingdom. Br J Gen Prac 1999; 49: 989-990.

23. Ferrara CM, Kumar M, Nicklas B, McCrone S, Goldberg AP.

Weight gain and adipose tissue metabolism after smoking cessation in women. Int J Obes Relat Metab Disord 2001; 25: 1322-1326.

24. Al-Nuaim AA, Bamgboye EA, al-Rubeaan KA, al-Mazrou Y. Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. J Community Health 1997; 22: 211-223.

25. Kordy MN, El-gamal FM. A study of pattern of body mass index (BMI) and prevalence of obesity in a Saudi population. Asia Pac J Public Health 1995; 8: 59-65.

26. Legato MJ. Gender-specific aspects of obesity. Int J Fertil Womens Med 1997; 42: 184-197.

Review Articles

Trends and Some Aspect of Ageing in Bangladesh

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ABSTRACT

The aim of the present study is to analyze the dynamics and some aspects of ageing prevailing in Bangladesh. For this purpose analysis used secondary data of Bangladesh Bureau of Statistics (BBS). Population of age 60 and more is considered as the aged population. Here some statistical and demographic tools were used, such as, stepwise regression model, index of ageing and dependency ratio to analyze the data.The result shows that fertility and mortality decline with increasing age in the older population in Bangladesh. In 2001, the growth of older persons exceeds the growth rate of the total population and aged population will double between 2005 and 2030. Most older persons lived in rural areas. From the regression analysis, we find that among the variables OTGR, OHHS and OADR are d significantly influential variables on OAGR which is explained by 67% of the total variation.

Key words and phrases: Ageing, Index of ageing, dependency ratio, stepwise regression, eigen value, VIF.

Introduction

Population ageing is one of the most distinctive demographic events nowadays. The literal meaning of the term "age" refers to the time during which a person or thing has lived or existed. The United Nations identifies exclusively for the purpose of demographic comparison, populations who have reached the age of 60 years as "older persons". For developing countries, aged is defined as the population aged sixty years and above (UN 2004), and is an emerging issue in Bangladesh. Although in Bangladesh ageing is at its early stage compared with developed countries.

The elderly population (aged 60years and over) is rapidly increasing worldwide and the increase will, both in relative and absolute terms, be much more dramatic in low-income than in high-income regions of the world (UN 2003). Today, world-wide, there are around 690 million persons aged 60 years and over; this total will almost double by 2025 and is expected to reach nearly two billion by 2050. The vast majority of these older persons will reside in the developing world (Huber 2005). Out of a population of almost 140 million in Bangladesh, more than 7 million (5.1%) are aged 60 years and above (WHO 2005). By 2020, Bangladesh will, with a projected 14 million elderly people, be one of the 10 nations with the largest elderly population (Solomos et al. 2001, Kabir et al. 2005).

In the near future virtually all countries will face ageing of their population, although at varying levels of intensity and in different time frames. The prospects that the position of the elderly in Bangladesh may undergo significant changes in the current century and the next, causing a disproportionate accumulation of the very old, and therefore the most vulnerable sector of the population is rather high (Sattar & Rahman 1993). Responding to ageing in advance would enable countries to reap the "demographic dividend" produced by reduced fertility rates (Bloom et al. 2002, Kabir 1995).

Most of the developing countries are experiencing population ageing resulting in a rapid increase the proportion of population 60+. The rapidly increasing elderly population is a new and important group in terms of social economic and changing cultural context. In Bangladesh, the aging issue has only recently begun to emerge as a cause of concern. Interest in the subject of aging of the population is of very recent origin and it still needs research and understanding of the issues and their relationships.

To understand the inherent peculiarities about the growing number of aged population of Bangladesh the study is carried out with the following objectives.

To examine trends in some demographic parameters of the aged population;

To investigate various characteristics of the older persons;

To assess statistically the components affecting the intensity of ageing, dependency of the aged and some of their indicators.

Data and methods

Sources of data

The information presented here is secondary and we have used mainly the census data from the Bangladesh Population Census, held in 1991 & 2001, published in September & July 1994 & 2003 respectively; Analytical report and Statistical Yearbook of Bangladesh 2001, World Population Prospects 2004. All these data are officially published by Bangladesh Bureau of Statistics (BBS) a sponsored agency of Bangladesh Government.

The definition of the elderly is categorized as young-olds (who are of age 60-69 years), old-olds (who are of age 70-79 years) and extremely olds (who are of age 80 years and above). In case of Bangladesh, like many developing countries population aged 60 and over has been considered to be the aged or the elderly population (also older persons) (UN 2004). The present study is carried out considering the population of age 60 and over as the older person is the target population for analyzing ageing of population.

Methods

The study uses standard procedures for aged analyses: Aged growth rate, Total growth rate, Index of ageing, Aged dependency ratio, Total dependency ratio, Aged support ratio, Total support ratio, Familiar support ratio, Elderly sex ratio and also uses well known statistical techniques such as Collinerity statistics, multiple regression analysis and Stepwise regression analysis.

Stepwise regression technique is used to build the model of multiple regression analysis and is one of the most versatile data analysis procedures. Regression can be used to summarize data as well as to study relations among variables. But including a large number of independent variables in a regression model is never a good strategy, unless there are strong, previous reasons to suggest that they all should be included. The observed increase in R2 (Coefficient of determination) does not necessarily reflect a better fit of the model in the population (Montgomery & Peck, 1982). A model with many variables is often difficult to interpret. So, it is important to exclude potentially relevant independents. Thus, we applied the

stepwise selection procedures for selecting variables to be included in the model.

Results and Discussion

Trends of life expectancy, crude death rate and total fertility rate of ageing population:

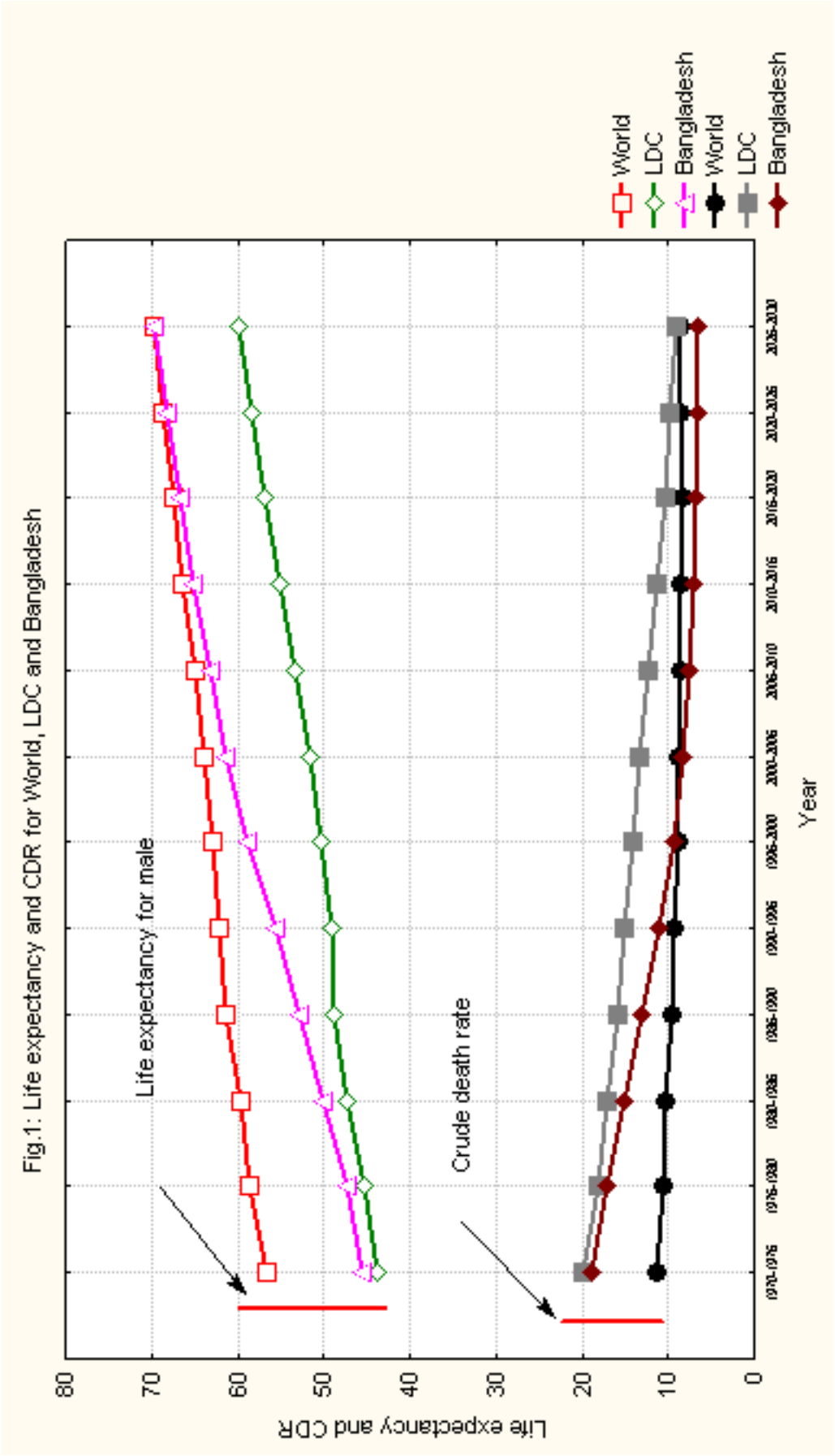


Fig.1: Life expectancy and CDR for World, LDC and Bangladesh

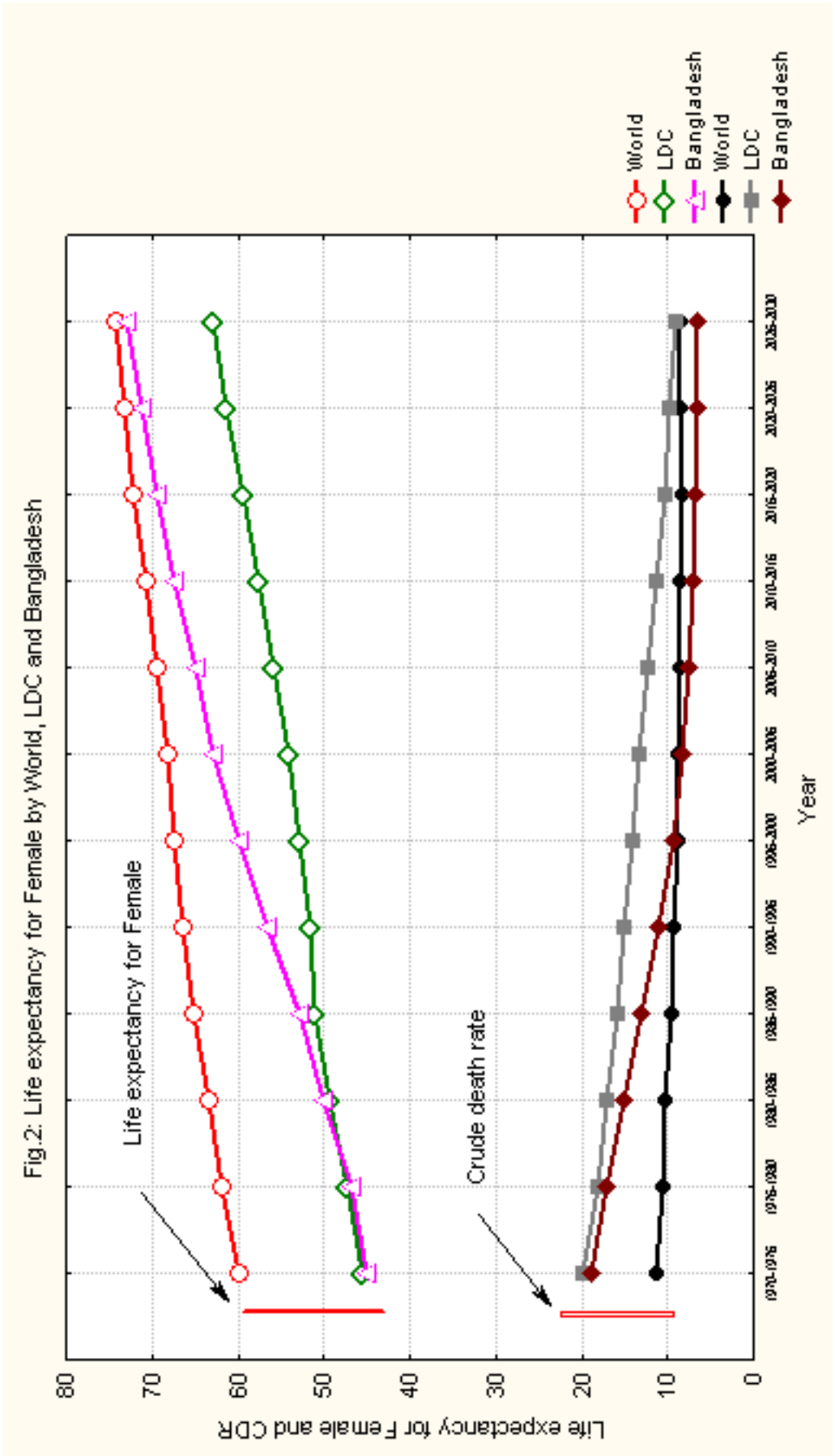

Fig.2: Life expectancy for Female by World, LDC and Bangladesh
Life expectancy for Female
Crude death rate
World
LDC
Bangladesh
World
LDC
Bangladesh
Life expectancy for Female and CDR
Year
0
10
20
30
40
50
60
70
80
1970-1975
1975-1980
1980-1985
1985-1990
1990-1995
1995-2000
2000-2005
2005-2010
2010-2015
2015-2020
2020-2025
2025-2030

Table1. Life expectancy at birth, crude death rate and total fertility rate by World, Lest Developed countries (LDC) and Bangladesh, 1970-2030

Region	Life Expectancy at Birth	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
	Males	56.7	58.5	59.7	61.3	62.1	63.0	63.9	65.0	66.3	67.5	68.6	69.6
World	Female	59.9	62.0	63.5	65.2	66.3	67.4	68.3	69.5	70.8	72.1	73.2	74.3
	Male	43.7	45.3	47.3	48.8	49.1	50.2	51.5	53.4	55.2	56.9	58.4	59.9
LDC	Female	45.5	47.2	49.3	51.0	51.7	52.8	54.0	55.8	57.7	59.5	61.3	63.0
	Male	45.6	47.1	50.1	52.9	55.5	59.0	61.3	63.2	65.1	66.8	68.3	69.6
Banglade-sh	Female	45.0	46.8	50.0	52.8	56.7	59.9	62.8	65.0	67.4	69.5	71.3	73.0
World	CDR	11.3	10.6	10.3	9.6	9.3	8.9	8.8	8.6	8.5	8.4	8.5	8.6
LDC	CDR	20.0	18.0	17.1	15.8	15.2	14.2	13.3	12.3	11.3	10.4	9.7	9.1
Bangladesh	CDR	18.9	17.2	15.0	13.0	11.1	9.2	8.2	7.5	7.0	6.7	6.5	6.6
World	TFR	4.47	3.92	3.58	3.38	3.05	2.80	2.65	2.55	2.46	2.37	2.29	2.21
LDC	TFR	6.61	6.39	6.28	6.00	5.68	5.29	4.95	4.63	4.31	3.99	3.68	3.39
Bangladesh	TFR	6.15	5.60	5.25	4.63	4.12	3.50	3.22	2.83	2.63	2.47	2.33	2.22

Note: LDC= Least Developed countries, CDR= Crude Death Rate and TFR= Total Fertility Rate

Table 1 and Figure 1 & 2 show that life expectancy at birth subsequently increasing for different years in the world, LDC and Bangladesh. The result shows that life expectancy for females is higher than males and their life expectancy is lower for Bangladesh than that of the world population and is comparatively lower for LDC. The older population in developing countries like Bangladesh is rapidly increasing by decline in mortality and fertility rates, mainly due to improved health conditions and family planning respectively. The decline in mortality rates has been the main trigger at the initial stage of the demographic transition (ESCAP 2004). As reflected by Table 1 and Figure 1 & 2, the decline in mortality rate has not only been a common feature in the World but also in LDC and Bangladesh. Fertility has also played a marginal role in the developing countries of the region at its primary stage. However, as reflected by Table 1 & Figure 3, total fertility rate of Bangladesh has substantially declined from 1970-75 to 2000-05 and in 2025-30 total fertility will be 2.22 and it is approximately same as the rest of the world.

Table 2. Percentage of aged population by World, Least Developed Countries and Bangladesh from 1970-2030

Region	**Percent**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
World	Percentage Aged 60 and Over	8.3	8.5	8.5	8.7	9.1	9.5	9.9	10.3	11.1	12.3	13.5	15.0	16.6
	Percentage Aged 65 and Over	5.4	5.6	5.9	5.8	6.1	6.5	6.9	7.3	7.7	8.3	9.4	10.5	11.7
	Percentage Aged 80 and Over	0.7	0.8	0.8	0.9	1.0	1.1	1.1	1.3	1.6	1.7	1.9	2.0	2.4
Least Developed Countries	Percentage Aged 60 and Over	4.9	4.9	4.9	4.9	4.9	4.9	5.0	5.1	5.2	5.5	5.9	6.3	6.9
	Percentage Aged 65 and Over	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.3	3.4	3.5	3.8	4.1	4.5
	Percentage Aged 80 and Over	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.6

Bangladesh	Percentage Aged 60 and Over	4.8	4.8	4.8	4.8	4.8	4.9	5.2	5.7	6.2	7.0	8.0	9.2	10.6
	Percentage Aged 65 and Over	2.9	2.9	2.9	3.0	3.0	3.1	3.3	3.5	3.9	4.3	5.0	5.8	6.8
	Percentage Aged 80 and Over	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.7	0.8

Population ageing is a process common to almost all developed and developing countries. The dynamics of population ageing differ from country to country depending on their level of economic and social development as well as policies adopted during the past. Table 2 shows that Bangladesh and LDC is already home for than half of the world's older aged and the share would continue to increase in the next 30 years later. The population aged 65 and over for Bangladesh has increased from 4.8% in year 1970 to 5.7% in 2005 and the latter 2030 years will be 10.6% of the total population. Increasing pattern of aged population during 1970 to 2000 for Bangladesh and LDC are approximately the same but later in 2000 it shows substantial difference up to 2030. After 2000 the percentage of aged population is higher than LDC. Population ageing has taken place at a rapid rate in the Asia-Pacific region during the past fifty years and would continue at a faster pace during the next fifty years (ESCAP 2004).

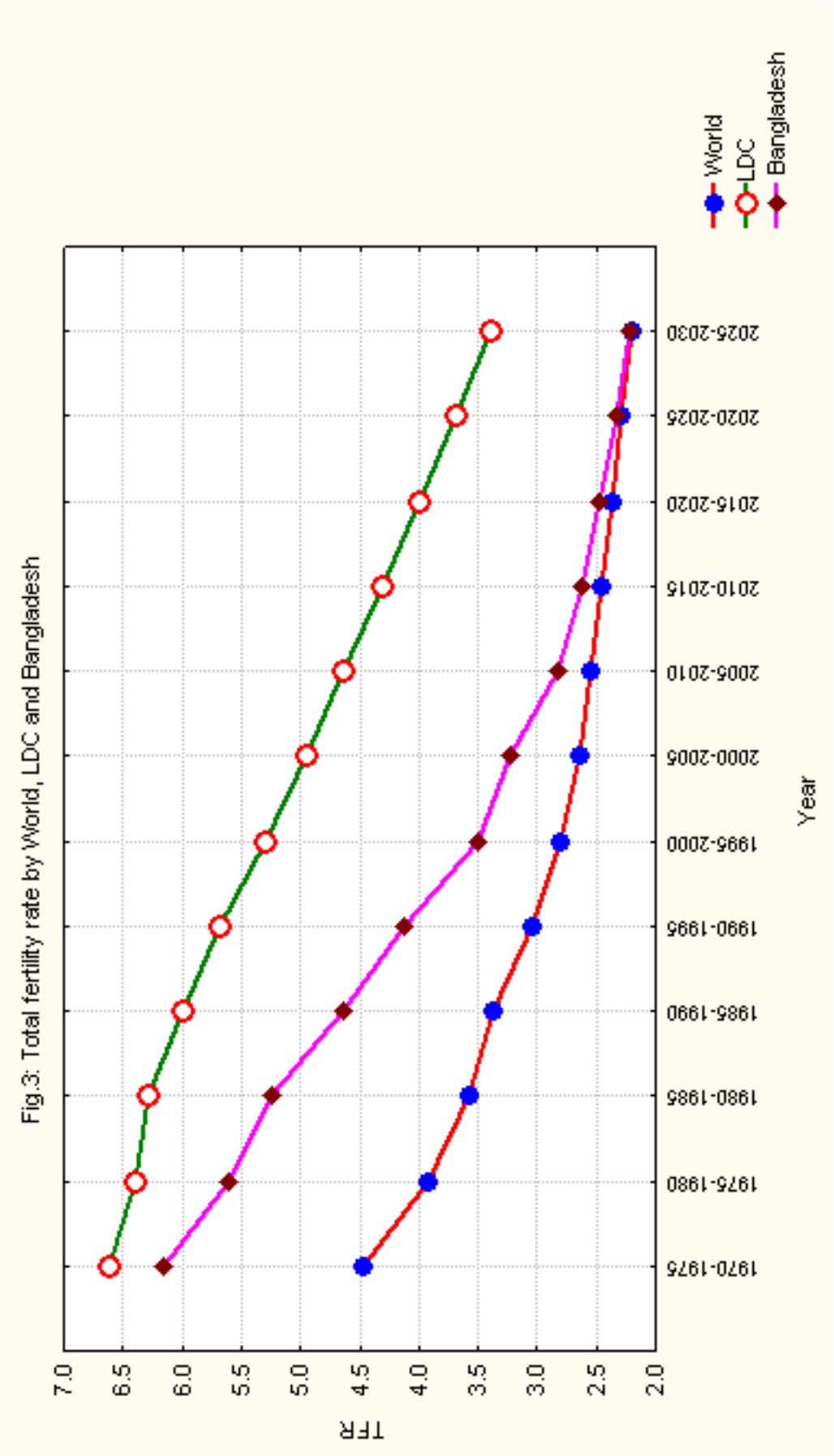
Indicators of ageing

Some indicators for studying the ageing situation of the country as a whole are provided in Table 3 & 4. These indicators are calculated using data both from 1991 and 2001 censuses.

Table 3. Some indicators of ageing population in Bangladesh, 1991

Name of Indicators	Value of the Indicator				
	Both	Male	Female	Rural	Urban
Size of the aged population	5702765	3207845	244920	4798135	445964
Size of the total population	106314992	54728350	51586642	85442788	9171790
Aged growth rate (1981-91) (%)	1.52	-	-	-	-
Total growth rate (1981-91) (%)	2.01	1.99	2.03	-	-
Percentage of elderly (%)	5.22	5.86	5.08	5.62	4.76
Index of ageing (%)	11.88	12.93	10.76	12.12	7.80
Aged Dependency Ratio (ADR) (%)	10.84	12.0	9.63	11.69	9.42
Total Dependency Ratio (TDR) (%)	102.06	104.85	99.19	108.14	93.32
Aged support ratio (ASR) (%)	9.23	8.33	10.38	8.56	13.61
Total support ratio (TSR) (%)	0.98	0.95	1.0	.92	1.07
Familial Support Ratio Type-I (FSR-I) (%)	256.24	250.92	262.61	250.61	264.63
Familial Support Ratio Type-II (FSR-II) (%)	67.50	65.99	69.36	67.29	68.05
Elderly Sex Ratio (M/F) (%)	128.58			127.57	131.13

Table 3 & 4 indicated that the aged population in 1991 was 5.7 millionamd is set to increase to 7.6 million in 2001, of 4.2 million for male and 3.4 million for female aged population. The rate of linear increment is 3.5% per annum. The temporal effect has largely fallen on the rural-urban elderly population. The rural older persons have 4.8 million in 1991 to rise 6.2 million in 2001 but in urban areas 45 million to 1.3 million aged population during 1991 through to 2001. The result shows that the elderly population is higher in rural areas than in urban areas. The share of women in the 60 years and over age group would increase from 5.08 per cent of the total in1991 to 5.60 per cent by 2001. In contrast, the share of men in that age group rises from 5.86 per cent to 6.58



per cent during the same period. This phenomenon is underlined by the higher life expectancy of women due to better survival chances at old age due to biological reasons. An important dimension of the ageing process is the rising share of women in the older age groups. Ageing has been a progressively gendered experience in the Asia-Pacific region (ESCAP 2004)

Table 4. Some indicators of ageing population in Bangladesh, 2001

Name of Indicators	Value of the Indicator				
	Both	**Male**	**Female**	**Rural**	**Urban**
Size of the aged population	7590340	4208180	3382160	6228180	1362160
Size of the total population	123851120	63894740	59956380	95245920	28605200
Aged growth rate (1991-91) (%)	2.90	-	-	-	-
Total growth rate (1991-91) (%)	1.54	1.56	1.51	4.24	3.20
Percentage of elderly (%)	6.13	6.58	5.60	6.54	4.87
Index of ageing (%)	15.58	16.44	14.63	14.89	13.94
Aged Dependency Ratio (ADR) (%)	11.01	12.35	10.11	12.40	10.80
Total Dependency Ratio (TDR) (%)	83.25	87.47	79.17	90.22	63.70
Aged support ratio (ASR) (%)	9.09	8.10	9.89	8.04	12.83
Total support ratio (TSR) (%)	1.20	1.14	1.26	1.11	1.57
Familial Support Ratio Type-I (FSR-I) (%)	256.55	260.13	252.19	245.95	303.10
Familial Support Ratio Type-II (FSR-II) (%)	66.22	65.25	67.39	66.12	66.63
Support Ratio for Working Population (%)	54.54	53.34	55.81	52.63	61.09
Aged population per house hold (%)	23.74	13.30	10.45	-	-
Elderly Sex Ratio (M/F) (%)	124.42			122.77	131.31

Work status of elderly population

The working status of elderly population both for male and female are shown in Table 5.
Table 5 shows that most of the female older are doing household work (58.1%), of which 60.2% are in rural areas and 52.2% in urban areas. Table 5 also shows that 51.3% male elder engaged in agriculture, particularly 57.9% in rural areas and 22.5% in urban areas. Transport, construction, services, hotel & restaurant and industrial work are involved in low percentages. Thus, the largest portion of male work force is engaged in agriculture and females are in household work.

Table 5. Percentage distribution of older persons by working status, sex and residence in Bangladesh, 2001

Working Status	**Rural**			**Urban**			**Total**		
	Male	**Female**	**Both**	**Male**	**Female**	**Both**	**Male**	**Female**	**Both**
Not working	19.4	29.9	24.1	26.7	37.4	31.3	20.7	31.2	25.4
Household work	3.6	60.2	28.9	2.9	52.2	24.2	3.4	58.7	28.0
Agriculture	57.9	4.9	34.1	22.5	3.1	14.1	51.3	4.6	30.6
Industry	0.8	0.2	0.5	1.9	0.3	1.3	0.9	0.2	0.6
Water, Gas, Electricity	0.05	0.006	0.05	0.2	0.08	0.1	0.46	0.007	0.04
Construction	0.7	0.03	0.4	1.9	0.2	1.1	0.9	0.05	0.5
Transport & Comm.	0.6	0.02	0.4	2.2	0.06	1.3	0.9	0.02	0.5
Hotel & Restaurant	0.05	0.006	0.05	0.3	0.05	0.2	0.1	0.01	0.06
Business	7.3	0.3	4.2	18.6	0.8	10.9	9.4	0.4	5.5
Service	0.9	0.2	0.6	1.7	0.3	1.1	1.0	0.2	0.7
Others	8.7	4.2	6.7	21.1	5.5	14.4	10.9	4.5	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

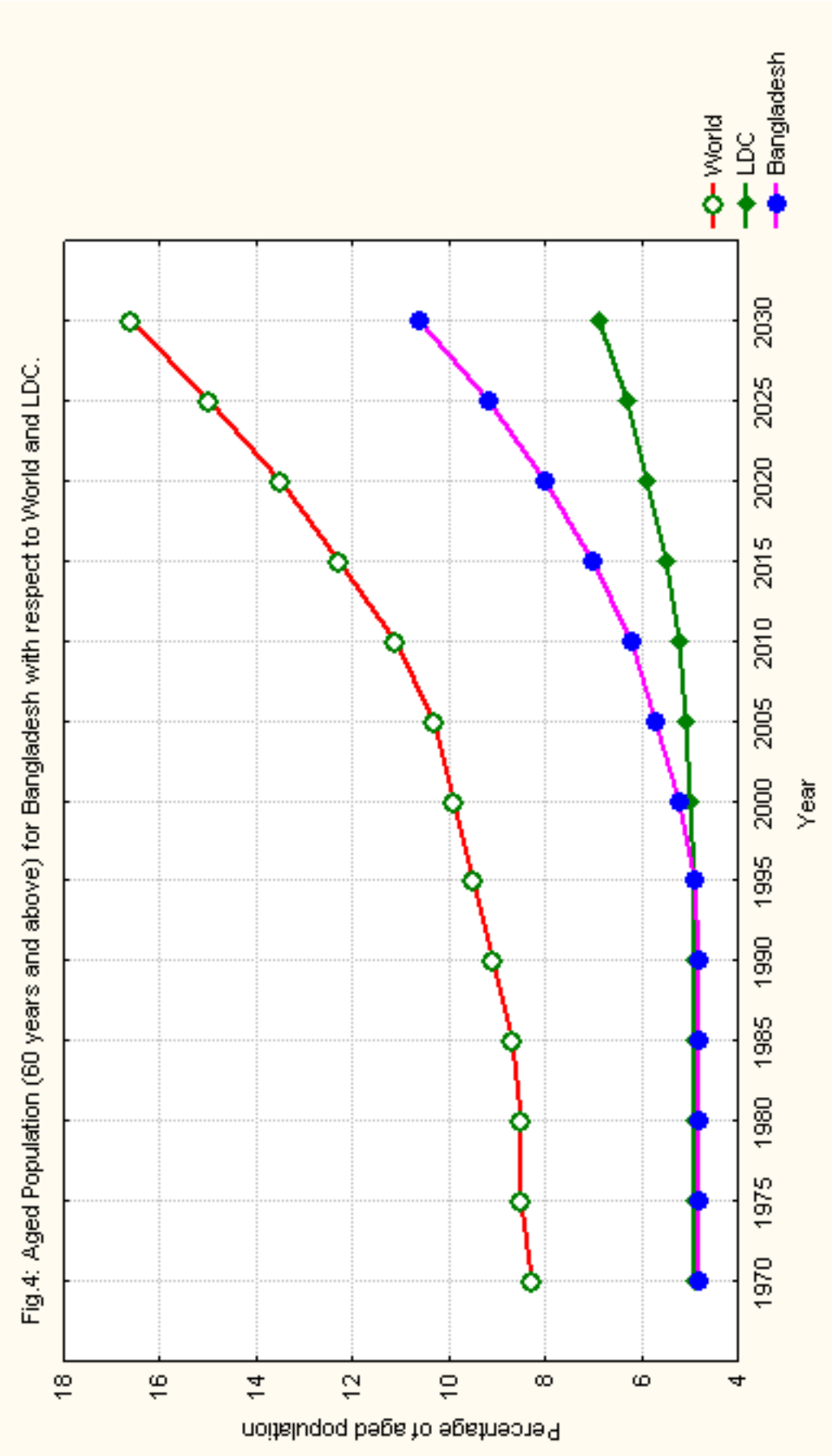


Fig.4: Aged Population (60 years and above) for Bangladesh with respect to World and LDC.

Multiple regression analysis

Therefore, to evaluate the multiple effects of explanatory variables OTGR(X11), RTGR(X13), OIA(X18), OADR(X21), OTDR(X24), OAPHH(X32), OHHS(X33), OALRAP(X34) on OAGR(X10) for census 2001 the following regression equation is assumed:

X10= ß0+ ß1X11+ ß2X13+ ß3X18+ ß4X21+ ß5X24+

ß6X32+ ß7X33+ ß8X34+U… … … (1)
X10= 1.579+ 0.0647X11+ 0.289X13+ 0.101X18+
1.30X21-0.472X24-1.074X32+
1.141X33+ 0.024X34+U… … …

Stepwise regression analysis

The multiple regression equation (1) of Overall Aged Growth Rate (X10) is assumed on eight explanatory variables. The stepwise regression methods are used and resulted in that only three of eight explanatory variables OTGR(X11), OHHS(X33) and OADR(X21) explain more than 66% of total variation in OAGR(X10).

Table 6. Estimates of stepwise regression analysis, OAGR(X10) as the dependent variables, Bangladesh, 2001

Explanatory variables	Multiple R	Value of R2	Mean square	d.f	Calculated F-ratio	Sig. F change	Durbin-Watson
OTGR(X11)	0.72	0.52	16.33	162	68.33	0.00	
OHHS(X33)	0.79	0.63	9.79	161	51.73	0.00	
OADR(X21)	0.82	0.67	6.91	160	39.82	0.01	2.00

The fitted regression equations by using stepwise regression command for the equation 1 are
X10= 1.83 + 0.74(X11) … … … 1(i)
(0.142) (0.089)
X10= 4.41+ 0.76 (X11) - 0.53 (X33) … … … 1(ii)
(0.634) (0.079) (0.129)
X10= 3.88 + 0.94 (X11) - 0.69 (X33) + 0.09 (X21) … … … 1(iii)
(0.642) (0.103) (0.137) (0.035)

(Note: all the regression coefficient, multiple correlation coefficients R, R2 and change in R2 are significant at 5% level; value in the braces indicates standard error of the estimate)

At the first step the variable OTGR (X11) is included in the model due to the largest correlation with OAGR (X10) among the eight variables. The value of R2 is 0.52 which indicates that approximately 52% of variation of OAGR is explained by OTGR. In the next two steps the variables OHHS and OADR are included in the model and the value of R2 0.67 with highly significant F ratio (F= 51.72 & 39.82, p= 0.000). Other variables are excluded from the model due to minimum tolerance and insignificant t ratio. From the final model we see that all the coefficients (Table 7) are highly significant including the intercept.

Table 7. Collinearity diagnostics for the variables included in the model when OAGR as dependent variables, Bangladesh, 2001

Model	**Dimension**	**Eigen value**	**Condition index**	**Variance proportions**	**OTGR**	**OHHS**	**OADR**
	1	1.93	1.00	0.05	0.05	…	…
1	2	0.09	4.43	0.95	0.95	…	…
	1	2.87	1.00	0.00	0.02	0.00	…
	2	0.13	4.74	0.01	0.98	0.01	…
2	3	0.03	27.74	0.99	0.00	0.99	…
	1	3.81	1.00	0.00	0.01	0.00	0.00
	2	0.18	4.60	0.00	0.40	0.00	0.02
	3	0.08	21.06	0.20	0.59	0.11	0.96
3	4	0.03	29.10	0.79	0.01	0.89	0.02

From Table 7 of collinearity diagnostics, we see that condition index corresponding to second, third and fourth eigen values are 4.60, 21.06 and 29.10 (below 30) indicates that there is no problem of multicolinearity in the data, the variance inflation factor (VIF) corresponding to OTGR, OHHS & OADR are 1.84, 1.25 & 2.02 is far below 5 also favors the conclusion (Table 8). But the variance proportion corresponding to the smallest eigen value, we see that for OTGR, OHHS & OADR the variance proportions are 0.01, 0.89 & 0.02 respectively.

The estimated coefficients for the model are shown in Table 7. From Table 7, we observed that OTGR and OADR is positively influencing and OHHS is negatively influencing to OAGR. Thus, we may come to the conclusion that if OTGR and OADR are decrease and OHHS is increase then OAGR must be increase.

Table 8. Estimated coefficients obtained from stepwise regression considering OAGR as dependent variables in Bangladesh, 2001

	Coefficients		S. coff.			95% CI		Collinerity Statistics	
Model	**β**	**S.E**	**β**	**t**	**Sig.**	**L.B**	**U.B**	**Tolerance**	**VIF**
Constant	1.83	0.14		12.89	0.000	1.55	2.12		
OTGR	0.74	0.09	0.72	8.27	0.000	0.56	0.91	1.00	1.00
Constant	7.41	0.64		6.96	0.000	3.14	5.68		
OTGR	0.76	0.08	0.75	9.56	0.000	0.60	0.92	0.99	1.01
OHHS	-0.53	0.13	-0.33	-4.15	0.000	-0.79	-0.28	0.99	1.01
Constant	3.87	0.64		6.04	0.000	2.56	5.16		
OTGR	0.94	0.10	0.92	9.14	0.000	0.73	1.14	0.54	1.84
OHHS	-0.69	0.14	-0.42	-5.02	0.000	-0.96	-0.42	0.80	1.25
OADR	0.09	0.04	0.27	2.56	0.013	0.002	0.16	0.49	2.02

Conclusion

Ageing is the process of life. Population ageing in Bangladesh is becoming a serious concern for the development agendas. From the results, we find that relative ageing of the old aged population itself is becoming a notable feature of the ageing process in the LDC and Bangladesh. A larger fraction of the older population in the world is living in the LDC and Bangladesh and is growing faster. In Bangladesh, the proportion of persons aged 60 and over is expected to double between 2005 and 2030, from 5.7% to 10.6%.

In the regression model (1), OTGR(X11) is the first most influential variable, OHHS(X33) is the second influential variable, and OADR(X21) is the third influential variable, which explains 67% of the total variation in OAGR(X10). By using stepwise regression we concluded from this model if there is a decrease in the aged growth rate then we must decrease total growth rate and aged dependency ratio.

Aged population in the next decades will encounter different socio-economic circumstances and rapid technological change. Social integration is the best way to help develop under the changing situations. Aged populations are the respected senior citizens of our country. So, we all should come forward to meet their basic needs and provide the needed services for their well-being. Some policy could be taken to to develop their mental and socio-economic conditions are as follows:

The elderly people need security in their entire remaining life. This can be done through the social security system and by taking community based activities.

Elderly peoples' problem is assuming importance in Bangladesh because there will be a steep rise in its elderly population in coming years. So, it needs to change this negative attitude and Government, NGOs, communities and families should come forward. For their standard living status, we need to provide more or less financial support and should be given to jobs like small business.

References

Bangladesh Bureau of Statistic (BBS). (1991). Population Census: 1991, Preliminary Report, Government of the People's Republic of Bangladesh, Dhaka.
……. (1994). Statistical Year Book of Bangladesh 1994.
.....(2001). Population Census: 2001, Preliminary Report, Government of the People's Republic of Bangladesh, Dhaka.

Bloom, D., David Cunning and Jaypee Sevilla (2002). The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change, RAND Publication available at http://www.rand.org/publications/MR/MR1274/ ,(Accessed on 30 November 2004).

Huber, B. (2005). Implementing the Madrid Plan of Action on Ageing. Chief, generational issues and integration section, United nations Department of Economic and Social Affairs. Mexico, D.F., 31 August 2005.

Kabir, M.M. (1995). The Age and Aged in Bangladesh. Paper presented at the Fifth National Statistics Conference of the Bangladesh Association, 27-28 January, Dhaka.

Kabir, M.M., Haque, M. and Chaklader, H. (2005). Mainstreaming ageing in health: Will it be possible. Paper presented in the international conference on Mainstreaming ageing in health system and rural development, Held in Dhaka, November, 29-30, 2005.

Economic and Social Commission for Asia and the Pacific (ESCAP). (2004). Dynamics of Population Ageing: How can Asia-Pacific Respond?. Expert Group Meeting on Development Issues and Policies, Bangkok.

Montgomery, Douglas, C. & Peck, Elizabeth A. (1982). Introduction to linear Regression Analysis. New York: John Wiley and Sons.

Sattar., A.M. and Rahman, M.M. (1993). The Elderly in Bang-

ladesh 1911-2025. Asian Profile. Vol. 6.

Solomons, NW. Health and Ageing. In: Flores R. Gillepsie S. eds. Health and Nutrition: Emerging and Remerging issues in Developing countries. Washington. DC. International Food Policy Research Institute, 2001.

United Nations (UN). (2003). World Population Prospects: The 2002 Revision. Highlights. New York: UN, 2003.
…… (2004). World population ageing 1950-2050, United Nations, New York
…… (2005). World Population Prospects: The 2004 Revision, vol. 1: Comprehensive Tables (Sales No. E.05.XIII.5); vol. II: Sex and Age Distribution of Population (Sales No. E.05. XIII.6).

World Health Organization (WHO). (2005). The World Health Report 2004 changing History, 2004. Available at http//www.who.int/whr/2004, (Accessed 4 January 2005).

End note: OAGR(X10) = Over all aged growth rate, OTGR(X11) = Over all total growth rate, OHHS(X33) = Over all household size and OADR(X21) = Over all dependency ratio, RTGR(X13) = Rural total growth rate, OIA(X18) = Overall index of ageing, OTDR(X32) = Overall total dependency ratio, OALRAP(X34) = Overall literacy rate among aged population

Clinical Research and Methods

Estimation of Some Mortality Measures, Modeling of l_x and Age Associated with Force of Mortality of Bangladesh in 2006

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ABSTRACT

The aim of the present study is to estimate some mortality measures such as age specific death rates (ASDRs), crude death rate (CDR), infant mortality rate (IMR), infant death rate (IDR) and child mortality rate (CMR) of Bangladesh in 2007. For this purpose, two abridged life tables for male and for female have been constructed. The secondary data on life expectancy at birth in Bangladesh is taken from UN (2006). These estimates are compared to the corresponding values of Bangladesh in 2005 and it is observed that these are showing decreasing trends during 2005-2007. Moreover, a mathematical model has been fitted to the number of persons surviving at an exact age x (l_x) for male and for female. Age associated with instantaneous force of mortality (μ_x) for male and female has been estimated. And it is found that is exhibiting decreasing trend up to age 25 for male and to age 30 for female and increasing in the remaining age group but rapidly increasing after age 55 years to infinity.

Introduction

Like many other developing countries, Bangladesh has not started complete Vital Registration System (VRS) yet. Nevertheless, Bangladesh Demographic and Health Survey (BDHS) procure data on a sampling basis but they do not provide sufficient information on mortality data. For this, information on mortality completely depends on censuses as well as other sources by means of some sophisticated indirect techniques. A number of good research works on fertility has been carried out but mortality works are studied in a very limited scale in Bangladesh. On these grounds, an endeavor has been given interest to estimate some mortality measures indirectly from very simple data. In this study, firstly, two abridged life tables have been constructed. It is to be noted here that a life table is very sophisticated and mathematical tools in Population Science, particularly, in Demography in up to the minute technological period. Life table is far and wide used to estimate various demographic parameters such as IMR, IDR, CDR,CMR, ASDRs, net reproduction rate (NRR), survival rate, replacement index. It is also applicable to enumerate net migration rate. It is also broadly used in life insurance companies.

Abridged life table for male has been constructed applying Widowhood Method (Islam et al, 2003). Then, in this report, IMR, CDR and ASDRs were calculated from the constructed life table and showed that ASDRs follow a traditional U-shape pattern. Abridged life table for female has been constructed applying Widowhood Method from male widowed information (Islam, 2005). Islam (2006) estimated indirectly ASDRs, CDR and IMR of Bangladesh in 2005 from the constructed abridged life tables in which these were showing a decreasing trend. So, it is found that there have been changes in the declining trend in mortality levels in Bangladesh. Therefore, the main aims and objectives of this study are given in the following:

i) to construct life tables for males and females and hence to estimate IMR, IDR, CDR, ASDRs, and CMR of Bangladesh in 2007, and

ii)to fit a mathematical model to lx values for males and females and then to estimate age associated with instantaneous force of mortality (μ_x) for males and females of Bangladesh in 2007.

Data and Methodology

The life expectancy at birth for maless=s63 and for femaless=s65 of Bangladesh in 2006 are taken from

UN (2006). It is noted that the life expectancy at birth in developing countries is gaining at a rate of 0.5 (UN, 1967). Therefore, it is assumed that the life expectancy at birth for males = 63.5 and for females = 65.5 of Bangladesh in 2007, that is used as raw material in this study.

To estimate lx values for corresponding life expectancy at birth using South Asian Model Life Tables from United Nations Model Life Tables for Developing Countries (UN, 1982), the interpolation method (UN, 1983) is employed here. Thereafter, abridged life tables are constructed using the following mathematical relationships:

$_nd_x = l_x - l_{x+n}$, $l_{x+n} = l_x \, {}_nP_x$, $_nL_x = \int_0^n l(x+t)\,dt$ which can be approximated as $_nL_x = \frac{n\,(l_x + l_{x+n})}{2}$ $(x \geq 2)$ where as $L_0=0.3l_0+0.7l_1$ and $L_1=0.4l_1+0.6l_2$, $T_x = \int_0^\infty l(x+t)\,dt$ that is equivalent to $T_x = \sum_{t=0}^{\infty} L_{x+t}$, $e_x = \frac{T_x}{l_x}$.

Thereafter, ASDRs are indirectly estimated from the constructed life table using the formula ASDRs = $\frac{{}_nd_x}{{}_nL_x}$ (Barclay, 1958). These are shown in Table 1 and Table 2. Moreover, ASDRs for both sexes are estimated by using the formula ASDRs $\frac{{}_nd_x^m + {}_nd_x^f}{{}_nL_x^m + {}_nL_x^f}$ from the constructed life tables of male and female and presented in the last column of Table 2. Life table CDR is estimated using the formula $CDR = \frac{1}{e_0} \times 1000$; where e0 is the life expectancy at birth. For this, the expectation of life at birth for both sexes is estimated from the constructed life tables using the formula $e_0^0 = \frac{e_0^f + s\,e_0^m}{1+s}$; where as e_0^f is the expectation of life at birth for male, e_0^m is the expectation of life at birth for female and s is the sex ratio at birth. In the case of this study, it is assumed to be 1.05 as a developing country (UN, 1967). Moreover, IMR is also calculated and in this case it is, in fact, $_1q_0$, that is, the probability of dying before the first birthday. Furthermore, CMR is estimated and it is indeed $_4q_0$, that is, the probability of dying between the first and fifth birthday.

The force of mortality at age x is defined as the ratio of instantaneous rate of decrease in lx to the value of l_x. It is denoted by μ_x and is given by the following expression in Differential Calculus:

$$\mu_x = lt_{t\to 0} \frac{l_{x+t} - l_x}{t.l_x} = -\frac{1}{l_x}\frac{d}{dx}(l_x) = -\frac{d}{dx}(\ln l_x)$$

(Biswas, 1988; Keyfitz, 1968; Shryock, 1975).

Model Fitting

It appears from the scattered plot of the number of persons surviving at an exact age x (lx) for males and females of Bangladesh in 2007 by age groups that lx can be distributed by polynomial model for different ages. Therefore, an nth degree polynomial model is treated and the structure of the model is given by

i) $y = a_0 + \sum_{i=1}^{n} a_i \, x^i + u$ (Montgomery and Peck, 1982),

where, x is age group; y is l_x for male and female; a_0 is the constant; a_i is the coefficient of x^i (i =1, 2, 3, ..., n) and u is the error term of the model. Here, in both cases, an appropriate n has been selected such that the error summation of square is least.

Using the software STATISTICA, the mathematical models have been estimated.

Model Validation Technique

To test the stability of the model, the cross validity prediction power (CVPP), ρ^2_{cv}, is applied here. The method for CVPP is given by

$$\rho^2_{cv} = 1 - \frac{(n-1)(n-2)(n+1)}{n(n-k-1)(n-k-2)}(1-R^2)$$

; where, n is the number of cases, k is the number of predictors in the model and the cross-validated R is the correlation between observed and predicted values of the dependent variable. The shrinkage of the model is the absolute value of the difference ρ^2_{cv} of and R^2. Moreover, the stability of R^2 of the model is equal to (1- shrinkage) (Stevens, 1996). Note that CVPP was also employed as model validation by Islam (2003, 2004, 2005 and 2006) and Islam et al (2003).

F-test

The F-test is applied to the model to verify the measure of the overall significance level of the model as well as the significance of R^2. The formula for F-test is affirmed as

$$F = \frac{R^2 / (k-1)}{(1-R^2) / (n-k)}$$ with (k-1, n-k) degrees of freedom (d.f.); where k = the number of parameters to be estimated, n is the number of classes and R^2 = the coefficient of determination of the model (Gujarati, 1998).

Results and Discussion

Two abridged life tables for males and for females have been constructed and shown in Tables 1 and 2 respectively. ASDRs for males and females of Bangladesh in 2007 have been estimated and presented in the respective tables. Moreover, ASDRs for both sexes of Bangladesh in 2007 have also been enumerated and shown in the last column of Table 2. To see the pattern of ASDRs of Bangladesh, these are plotted in graph paper, then, it is seen that they follow a traditional pattern, that is, U-shaped pattern. It is to be noted here that traditional pattern of ASDRs is a U-shape pattern (Misra, 1995; Shryock and Associates, 1975). To see the trend of ASDRs during 2005-2007, ASDRs of Bangladesh in 2005 is taken from Islam (2006) and presented in Table 3. It is observed that ASDRs for male, female and both sexes in 2007 are strictly lower at every age than that of ASDRs for male, female and both sexes in 2005 excepting the last age group. That is, they are indicating decreasing trend with passing of time.

The CDR, IMR, IDR and CMR for male, female and both sexes of Bangladesh in 2007 are calculated using the information from the constructed life tables and presented in Table 4. To estimate CDR for both sexes in 2007, life expectancy at birth is estimated as 63.99 years from the constructed male and female life tables. To see the trend of CDR, IMR, IDR and CMR during 2005-2007, the CDR, IMR, IDR and child mortality rate in 2005 have been taken from Islam (2006) and presented in Table 4. Here, it is observed that CDR, IMR, IDR and CMR for male, female and both sexes in 2007 are exhibiting decreasing trend during 2005-2007.

The fitted model of l_x values for male of Bangladesh in 2006 is:
$y=93634.87-660.195x+24.27725x^2-0.32979x^3$ ... (i)
t-stat (88.19) (-4.521) (5.49790) (-9.34711)
providing the coefficient of determination R^2 is 0.99246 and = 0.9892.

The fitted model of l_x values for female of Bangladesh in 2006 is:
$y=94361.12-842.215x+31.30959x^2-0.3807x^3$ ... (ii)
t-stat (106.53) (-6.914) (8.49957) (-12.9340)
providing the coefficient of determination R^2 is 0.99384 and ρ^2_{cv} = 0.9912.

The findings on model fitting have been shown in Table 5. From this table it is seen that the fitted models are highly cross-validated and their shrinkages are only 0.003073 and 0.002553 respectively. Furthermore, the fitted models will be stable more than 98% and 99%. Moreover, from this table, it is seen in the view of statistics that the parameters of the fitted models are highly significant, both explaining more than 98% and 99% of variance respectively. From t-statistics, it is found that all the parameters of the model are also highly significant. In both models, the stability of R^2 is more than 99%.

The calculated value of F-test of the models are 842.6563 and 1016.15 with (3, 18) d.f. respectively whereas the corresponding tabulated value is only 5.09 at 1% level of significance. Therefore, it seems from the statistics that the overall measure of the fitted models and its R^2 are highly statistically significant. Hence, the fit of both modelsis good.

Age associated with instantaneous force of mortality (μ_x) is calculated from the fitted model of l_x values for the male and female population of Bangladesh in 2007 that is presented in the 5th and 6th columns of Table 3 and shown in Fig. 1. From the Table 3 and figure, it is found that force of mortality for males and females is

decreasing up to age group 25 for males and to age 30 for females and strictly increasing in the whole age range, but rapidly increasing after the age interval 55 and above, that is, to infinity.

Conclusion

Fig 1. Force of Mortality for Male and Female of Bangladesh in 2006. X: Age group and Y: Force of Mortality

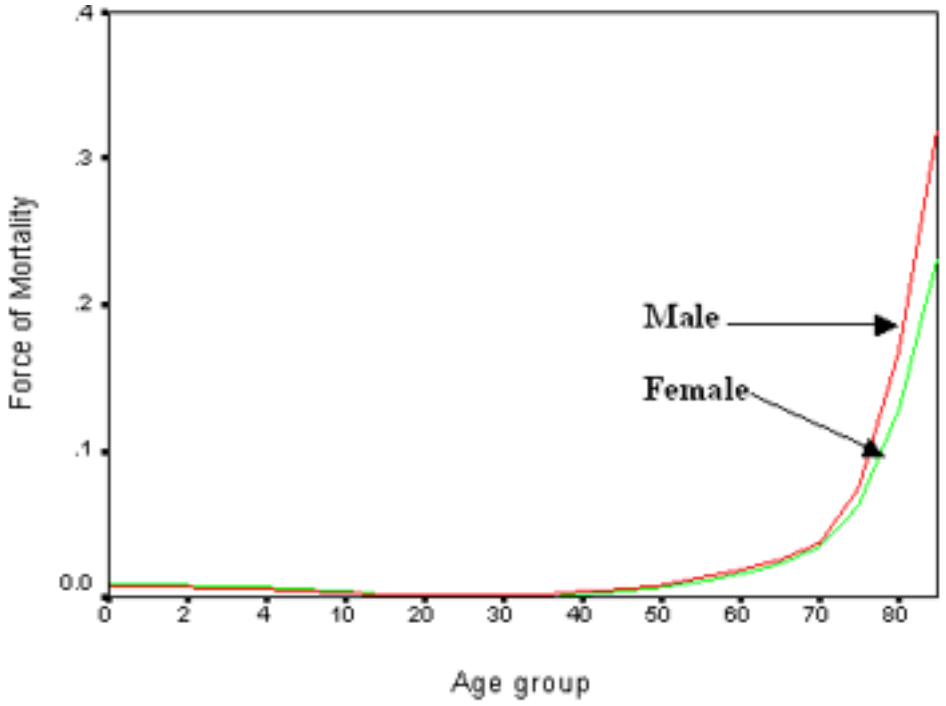


Table 1 An Abridged Life Table and ASDRs for Male of Bangladesh in 2007

age x	lx	dx	qx	px	Lx	Tx	ex	ASDRs
0	100000	7289	0.07289	0.92711	94898	6302819	63.03	.0768
1	92711	1550	0.016719	0.983281	91781	6207922	66.96	.0169
2	91161	754	0.008271	0.991729	90784	6116141	67.09	.0083
3	90407	455	0.005033	0.994967	90180	6025357	66.65	.0050
4	89952	305	0.003391	0.996609	89800	5935177	65.98	.0034
5	89647	689	0.007686	0.992314	446513	5845378	65.20	.0015
10	88958	315	0.003541	0.996459	444003	5398865	60.69	.0007
15	88643	389	0.004388	0.995612	442243	4954863	55.90	.0009
20	88254	461	0.005224	0.994776	440118	4512620	51.13	.0010
25	87793	571	0.006504	0.993496	437538	4072503	46.39	.0013
30	87222	704	0.008071	0.991929	434350	3634965	41.67	.0016
35	86518	1003	0.011593	0.988407	430083	3200615	36.99	.0023
40	85515	1525	0.017833	0.982167	423763	2770533	32.40	.0036
45	83990	2375	0.028277	0.971723	414013	2346770	27.94	.0057
50	81615	3833	0.046964	0.953036	398493	1932758	23.68	.0096
55	77782	5694	0.073205	0.926795	374675	1534265	19.73	.0152
60	72088	8439	0.117065	0.882935	339343	1159590	16.09	.0249
65	63649	11029	0.173278	0.826722	290673	820248	12.89	.0379
70	52620	13257	0.251938	0.748062	229958	529575	10.06	.0577
75	39363	13491	0.342733	0.657267	163088	299618	7.61	.0827
80	25872	11502	0.444573	0.555427	100605	136530	5.28	.1143
85	14370	14370	1	0	35925	35925	2.50	.4000

Table 2 An Abridged Life Table for Female and ASDRs for Female and Both Sexes of Bangladesh in 2007

age x	lx	dx	qx	px	Lx	Tx	ex	ASDRs	ASDRs(both)
0	100000	7142	0.07142	0.92858	95001	6499546	65.00	.0752	.0797
1	92858	1576	0.016972	0.983028	91912	6404545	68.97	.0171	.0183
2	91282	751	0.008227	0.991773	90907	6312633	69.16	.0083	.0089
3	90531	442	0.004882	0.995118	90310	6221727	68.72	.0049	.0053
4	90089	290	0.003219	0.996781	89944	6131417	68.06	.0032	.0036
5	89799	624	0.006949	0.993051	447435	6041473	67.28	.0014	.0016
10	89175	272	0.00305	0.99695	445195	5594038	62.73	.0006	.0007
15	88903	368	0.004139	0.995861	443595	5148843	57.92	.0008	.0009
20	88535	439	0.004958	0.995042	441578	4705248	53.15	.0010	.0011
25	88096	510	0.005789	0.994211	439205	4263670	48.40	.0012	.0013
30	87586	642	0.00733	0.99267	436325	3824465	43.67	.0015	.0016
35	86944	839	0.00965	0.99035	432623	3388140	38.97	.0019	.0023
40	86105	1177	0.013669	0.986331	427583	2955518	34.32	.0028	.0033
45	84928	1710	0.020135	0.979865	420365	2527935	29.77	.0041	.0051
50	83218	2770	0.033286	0.966714	409165	2107570	25.33	.0068	.0085
55	80448	4410	0.054818	0.945182	391215	1698405	21.11	.0113	.0136
60	76038	6905	0.09081	0.90919	362928	1307190	17.19	.0190	.0224
65	69133	9855	0.142551	0.857449	321028	944263	13.66	.0307	.0349
70	59278	13016	0.219576	0.780424	263850	623235	10.51	.0493	.0541
75	46262	14885	0.321754	0.678246	194098	359385	7.77	.0767	.0806
80	31377	14008	0.446442	0.553558	121865	165288	5.27	.1149	.1160
85	17369	17369	1	0	43423	43423	2.50	.4000	.4000

Table 3 ASDRs for Male, Female and Both Sexes in 2005 for Bangladesh and Force of Mortality for Male and Female in 2007 for Bangladesh.

Age (x)	ASDRs (m)	ASDRs (f)	ASDRs (b)	Force of Mortality for Male in 2007 (Smoothed)	Force of Mortality for Female in 2007 (Smoothed)
0	0.08423	.0934	.0888	0.007004	0.008861
1	0.019409	.0246	.0220	0.006542	0.008282
2	0.009594	.0121	.0109	0.006089	0.007716
3	0.00581	.0072	.0065	0.005650	0.007167
4	0.003911	.0048	.0043	0.005135	0.006505
5	0.001763	.0021	.0019	0.004277	0.005374
10	0.000801	.0009	.0008	0.002976	0.003627
15	0.000984	.0012	.0011	0.001677	0.001724
20	0.001176	.0015	.0013	0.000936	0.000444
25	0.00146	.0017	.0016	0.000752	0.000052
30	0.001809	.0021	.0019	0.000969	0.000050
35	0.002586	.0027	.0026	0.001790	0.000400
40	0.003951	.0036	.0038	0.003339	0.001595
45	0.006228	.0051	.0057	0.005578	0.003691
50	0.010309	.0083	.0093	0.008596	0.006598
55	0.016109	.0136	.0148	0.012629	0.010450
60	0.026128	.0224	.0243	0.018048	0.015581
65	0.039668	.0354	.0375	0.024915	0.022310
70	0.05996	.0559	.0579	0.037345	0.033865
75	0.085505	.0858	.0857	0.074523	0.062525

80	0.117268	.1249	.1212	0.168442	0.127968
85	0.40000	.4000	.4000	0.321075	0.231183

Table 4 The CDR, IMR, IDR and CMR for Male, Female and Both Sexes of Bangladesh in 2005 and 2007

	CDR (per thousand)			IMR (per thousand)		
Year	Male	Female	Both Sexes	Male	Female	Both Sexes
2005	16.31	16.48	16.39	80	88	84
2007	15.87	15.39	15.63s	73	71	72.16
	IDR (per thousand)			CMR (per thousand)		
Year	Male	Female	Both Sexes	Male	Female	Both Sexes
2005	84.23	93.4	88.8	38	48	43
2007	76.8	75.18	75.99	33	33	33

Table 5 Information on Model Fittings

Model	n	k	R^2	$\rho^2_{\sigma\tau}$	Shrinkage	Parameters	Significant Probability (p)
(i)	22	3	0.99293	0.989861	0.003073	a0 a1 a2 a3	0.000 0.000 0.00002 0.00000
(ii)	22	3	0.99413	0.991577	0.002553	a0 a1 a2 a3	0.000 0.000 0.0000 0.00000

It is found that ASDRs, CDR and IMR for male, female and both sexes are showing a decreasing trend over time during 2005-2006. It is seen 1_x that the values for male and female follows the 3rd degree polynomial, i. e. cubic polynomial model. It is observed that force of mortality (μ_x) for males and females is decreasing in the age interval 0 to 25 and increasing in the remaining age interval. We hope the latest findings on the life table as well as mortality, would encourage the government and non-government organizations (NGOs), researchers, academicians and planners to plan to bolster the socio-economic development and health care program in the country. Life insurance companies might be helped by the updated information of life tables in this study to boost their plan of insurance.

References

Ali, M. Korban (1990). Construction of Life Tables and Estimation of DemographicParameters of Bangladesh, The Rajshahi University Studies Part-B, Vol. 18, Page-239-250.

Barclay, G. W. (1958). Techniques of Population Analysis, John Wiley and Sons, Inc.

BBS (2001). Population Census 2001 Preliminary Report, Government of the People's Republic of Bangladesh, Dhaka.

Biswas, S. (1988). Stochastic Processes in Demography and Applications, Wiley Eastern

Limited, New Delhi.

Gujarati, Damodar N. (1998). Basic Econometrics, Third Edition, McGraw Hill, Inc., New York.

Islam, Md. Rafiqul. (2006). Construction of Abridged Life Tables and Indirect

Estimation of Some Mortality Measures of Bangladesh in 2005, Journal of

Population, Indonesia, Vol.11 (2), Page-117-130.

Keyfitz, N (1968). Introduction to the Mathematics of Population, Addison Wesley Publishing Company, Reading, Massachusetts.

Mitra, S. N. and Associates. (2001). Bangladesh Demographic and Health Survey, 1999-2000, National Institute of Population Research and Training (NIPORT), Dhaka, Bangladesh.

Misra, B. D. (1995). An Introduction to the Study of Population, Second Edition, South Asian Publishers Pvt. Ltd., New Delhi.

Montgomery, Douglas C. and Peck, Elizabeth A. (1982). Introduction to Linear Regression Analysis, John Wiley and Sons, New York.

Shryock, H.S. and Siegel J.S. and Associates. (1975). The Methods and Materials of Demography, Vol. II, U.S. Government Printing Office, Washington.

Stevens, J. (1996). Applied Multivariate Statistics for the Social Sciences, Third Edition, Lawrence Erlbaum Associates, Inc., Publishers, New Jersey.

United Nations (1982). Model Life Tables for Developing Countries, Department of International Economic and Social Affairs, Population Studies, No.77.

United Nations (1967). Manual IV, Methods of Estimating Basic Demographic Measures from Incomplete Data, Department of Economic and Social Affairs, Population Studies, No. 42, New York.

U. N. (1983). Mannual X. Indirect Techniques for Demographic Estimation, Department of International Economic and Social Affairs, Population Studies, No. 81, New York.

United Nations (2006). Population Data Sheet, ESCAP, Bangkok, Thailand.



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