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# Carotid Intima-Media Thickness- Is it a Useful Marker?

Pratap Sanchetee

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With increased longevity and life style changes, burden of non-communicable diseases like atherosclerosis, hypertension, diabetes, cancer and obstructive lung diseases is on rise. This transition is more evident in developing countries where infectious diseases are on decline. Atherosclerosis is a chronic progressive disorder which remains asymptomatic for a long time. It simultaneously affects coronary, carotids, aorta and other vessels in the body. Common risk factors for development of atherosclerosis are advancing age, ethnicity, hypertension, diabetes and metabolic syndrome, dietary habits, obesity and physical inactivity.<sup>1,2</sup> People in Asia including Indian subcontinent are ethnically vulnerable for metabolic syndrome and diabetes.<sup>3,4</sup> Recognition of atherosclerosis in subclinical stage is of paramount importance in planning for prevention of diseases like coronary artery disease (CAD), stroke and peripheral vascular disease (PVD).

The importance of preventive screening, risk stratification and management of atherosclerosis cannot be overemphasized. Technologies have been developed to identify atherosclerosis in the sub-clinical phase. Conventional contrast angiography is the gold-standard test for evaluation of coronary and cerebral arteries. However, this method is invasive, costly, equipment and expertise oriented, carries risk of anesthesia, and can not be repeated frequently. Alternative to this are computed tomography angiography (CTA), magnetic resonance angiography (MRA), electron beam computed tomography (EBCT), brachial artery reactivity testing (BART), and ankle brachial index (ABI).<sup>5-7</sup> These techniques have disadvantages of high cost, limited availability, advanced setup, exposure to radiation and

contrast, and decreased sensitivity and specificity. Thus there is need for a technique which is cheap, simple, non-invasive, reproducible, available at peripheral centers, carries low risk, sensitive and specific. Recent efforts have focused on evaluation of atherosclerosis using non-invasive imaging arterial beds and identification of the serum markers.<sup>8</sup>

It is often said that when one cerebral or coronary vessel is involved with atherosclerosis, four peripheral vessels also share the misery. The number and grade of atherosclerosis in extracoronary sites correlate with a increased cardiac risk. Autopsy studies have also confirmed close histological relationship between coronary, cerebral and carotid atherosclerotic disease.<sup>9</sup> Ultrasound assessment of easily accessible arteries has been advocated as a surrogate marker for coronary and cerebral arterial systems which are less accessible. This would also identify individuals with high risk of coronary events, stroke and peripheral vascular disease who lacks conventional risk factors.

Intima-media thickness (IMT) refers to endothelial cells, connective tissue and smooth muscles in the vessel wall. It is the site of lipid deposition and plaque formation. Measurement of the IMT by B-mode ultrasound is a well-validated procedure to detect the early stages of atherosclerosis. Ultrasound imaging also provides details on plaque presence and type, calcification, and wall diameter. It has the advantage of being cheaper, reproducible, and noninvasive. It is sensitive in detecting early atherosclerosis and plaques at risk of rupture. However, it remains to be established weather changes in one vascular bed correlate with other areas. Carotid intima-media thickness (CIMT) is a noninvasive marker and has shown to be a good indicator of the presence and extent of coronary and cerebral atherosclerosis. Use of ultrasound imaging for assessment of atherosclerotic changes in carotid arteries was first reported in 1991.<sup>10</sup>

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CIMT is commonly measured through B-mode (two-dimensional) images with linear ultrasound transducers between 7.5 and 10 MHz. It has the advantage of focusing on various segments of carotid artery. However, the small size of carotid IMT (usually <1 mm) necessitates computer-assisted software using electronic calipers that can provide a more accurate reading, reduction in analysis time and elimination of inter-observer bias. There are diverse approaches for measuring IMT, and some of these may lead to divergent results. Reproducibility studies indicate that intrareader differences in CIMT are in the range of 0.04 mm. It can be reduced by use of digital image acquisition and analysis, standard protocol for acquisition, automated edge detection devices for quantization and making multiple assessments across time.<sup>11</sup> Absolute definition of a cut-off for IMT is problematic because of a strong influence of age, gender, race and hypertension-related increase in IMT. In one of the study from India, average and maximum CIMT in healthy adults were 0.67 and 0.70 mm respectively.<sup>12</sup> In this issue of journal we have published an article describing CIMT in elderly with CAD and in normal persons from south India.

Several epidemiological studies and clinical trials have established that CIMT can be used as a surrogate marker to assess atherosclerotic burden independent of other risk factors.<sup>13</sup> These studies have also established that serial measurements of CIMT are markers of adverse outcomes of diseases like CAD, stroke, aortic atherosclerosis, and peripheral vascular disease.<sup>11,14,15</sup> It can also be used in individuals undergoing vascular interventions such as angiography, angioplasty or bypass surgery. Patients with risk for accelerated atherosclerosis (diabetes, hypertension, family history, rheumatoid arthritis and giant-cell arthritis) can also be screened for atherosclerotic burden. CIMT can also be used to assess the influence of risk factors, therapies and diet on progression and regression of atherosclerosis.

It has been found that risk of myocardial infarction and stroke increases by 10-18% with each 0.1 mm increase in the CIMT. Studies have shown that IMT was significantly more in patients with acute ischemic stroke when compared to controls and this difference persisted across all age groups.<sup>11,16</sup> In an Italian study, mean IMT in control subjects was 0.91 mm whereas

it was 1.04 mm in patients with nonlacunar stroke and 0.91 mm in patients with lacunar strokes. There are few Indian studies demonstrating independent association of CIMT with CAD.<sup>2,17</sup> CIMT, as observed in some of Indian studies, is between 0.32 mm to 0.79 mm which is lower than the reported value from the developed countries. It is need to be established if it is related to size of arteries or other factors.<sup>9,12,18</sup>

In spite of several evidences, IMT measurement has not been routinely performed in patients with risk for cardiovascular diseases. There are several limitations and unanswered questions with use of this technique as a screening tool for atherosclerotic burden in body. It is observer oriented and high degree of reproducibility will always be a question. Another issue is that the relationship between CIMT and the risk of vascular events is not strictly linear in most populations.<sup>11</sup> Further, severity of atherosclerosis is not identical in different vascular beds and interpolation of data will not be accurate one. Site of assessment of CIMT can also be of concern.<sup>11</sup> In one of the recent study, it was observed that blood pressure, age, gender, and race are linked with IMT in the common carotid artery and cholesterol levels have a stronger link with IMT at carotid bulb and internal carotid artery.<sup>19</sup> This study postulated that these differences are probably related to bifurcation geometry and differences in hemodynamics, such as shear stress and shear rates. Thus combination of CCA and ICA IMT will provide a better prediction for stroke and CAD.<sup>20</sup> Nomogram considering age, ethnicity, presence of risk factors for atherosclerosis need to be established before establishing CIMT as a screening tool.

Carotid IMT as a simple, non-invasive, free from radiation, safe, and cheap screening test for the assessment of risk and prognosis of CAD and stroke. It is well suited for large epidemiological studies for atherosclerosis. Detection and appropriate management of subclinical atherosclerosis will go a long way in preventing life threatening complications related to atherosclerosis, thus prolonging survival and increasing quality of life. However, it needs to be established whether measuring carotid IMT, or treating patients based on this measurement would reduce risk of atherosclerotic diseases. The role of conventional risk factors, blood biomarkers, CIMT and other imaging studies in assessing risk for atherosclerosis are

complementary and their precise roles need to be defined.

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# A Case Control Study of Carotid Intima-Media Thickness in Elderly South Indian Population with Coronary Artery Disease

E Babu\*, DKS Subrahmanyam\*\*, J Balachadar\*

## Abstract

**Introduction:** Coronary artery disease (CAD) is a major health problem worldwide including in India. Atherosclerosis is the major pathogenetic mechanism underlying CAD. Coronary angiography is the gold standard for identifying CAD but is invasive. Hence, novel noninvasive tools such as carotid intima-media thickness (CIMT) are being evolved to identify CAD.

**Aim:** The aim is to analyse the diagnostic utility of CIMT in elderly south Indian population with CAD

**Material and methods:** This case control study was conducted at JIPMER, Puducherry, over a period of 1 year. This study included two groups namely CAD group (n=30) and control group (n=26). Individuals (age  $\geq$  60 years) with either angiograph proven CAD or those with new onset ST elevation myocardial infarction comprised the CAD group. The control group consisted of age and sex matched individuals without risk factors for atherosclerosis and Framingham risk score of <10%. CIMT was measured in the far wall of common carotid artery, around 10 mm below the bifurcation, at end diastole using duplex ultrasonography.

**Results:** CAD group consisted of 16 males, 14 females, 18 diabetics, 22 hypertensives, 16 smokers and 6 cases with carotid plaque. The control group consisted of 14 males, 12 females, 6 hypertensives and 4 smokers. The mean $\pm$ SD CIMT was 0.85 $\pm$ 0.29 and 0.49 $\pm$ 0.07 mm in CAD and control groups respectively. The mean $\pm$ SD CIMT in individuals with angiographically proven CAD: single vessel, double vessel and triple vessel disease were 0.66 $\pm$ 0.05, 0.77 $\pm$ 0.08 and 1.19 $\pm$ 0.33 mm respectively. The difference in mean CIMT between two groups was statistically highly significant (t=6.281, p<0.0001). With increasing severity of CAD, CIMT increased (ANOVA F=11.21, p=0.0009). CIMT was inversely correlated to HDL (r=-0.5605, p<0.0001). The sensitivity and specificity for detecting significant CAD in using CIMT >0.63mm as the cut off is 80% and 100% respectively.

**Conclusion:** CIMT is a surrogate marker of atherosclerosis in CAD.

**Key words:** coronary artery disease, carotid intima-media thickness, elderly, south Indian population, surrogate marker, atherosclerosis.

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## Introduction

Coronary artery disease (CAD) is a major health problem worldwide. It is needless to say that it is true in our country also. The major pathogenetic mechanism underlying CAD is atherosclerosis.<sup>1</sup> The gold standard for identifying CAD even today is coronary angiography.

Coronary angiography is an invasive procedure and may not detect early atherosclerosis because luminal stenosis occurs only when at least 40% of the coronary artery is encroached by the atheromatous plaque.<sup>1</sup> The severity of stenosis is generally estimated visually which is delimited by interobserver variability. The presence of diffuse disease may also lead to underestimation of stenosis because the stenosed areas are expressed as a percent of luminal diameter compared with the adjacent normal coronary segments.

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Atherosclerosis is a generalised process simultaneously involving multiple vessels in the human body.<sup>1</sup> Therefore, a patient with CAD will also have evidence of atherosclerosis in peripheral artery like carotid artery. Analysis of these vessels will be of helpful in indirectly gaining some knowledge about the degree of atherosclerosis at the level of coronaries. Using this principle, newer methods that are simple, novel and noninvasive are being constantly evolved to identify CAD. Carotid intima-media thickness (CIMT) is one such marker being extensively studied.

In individuals with CAD, the distribution of disease tends to be non-uniform within a given vascular bed and even at the same area (eccentric involvement).<sup>1</sup> Most of these individuals demonstrate evidence of atherosclerosis in their common carotid artery, making it an ideal site for measurement of CIMT.<sup>2-4</sup>

CIMT is age dependant and increased in subjects with CAD.<sup>5-10</sup> The presence of carotid plaque (CIMT >1 mm) also gives pertinent information about the atherosclerotic burden.<sup>3</sup> Studies done in different ethnic races ascribe different range of values for CIMT.<sup>11-13</sup> There is no unanimous opinion about the cut off value of CIMT to detect CAD. There are not many studies done in Indian population. Hence, this study was undertaken to know the usefulness of CIMT in elderly south Indian population with CAD.

## Materials and Methods

This was a prospective case control study in humans. There were two groups in this study: CAD group and control group with a sample size of 30 subjects and 27 subjects respectively. The subjects for the study were chosen from those who attended the OPD or got admitted in the Department of Medicine or Cardiology at JIPMER for a period of 12 months from 1<sup>st</sup> October 2005. Controls were chosen from the attendants of individuals with CAD and from the healthy volunteers of the hospital.

The inclusion criteria for CAD group were:

- I. Individuals with age  $\geq$  60 years *and*
  - II. Individuals with angiographically proven CAD i.e., more than 50% stenosis of at least one epicardial coronary artery
- or
- individuals with new onset ST elevation myocardial infarction (STEMI), who are strongly suspected to have atherosclerotic etiology.

The inclusion criteria for control group were:

1. Age & sex matched healthy individuals without
  - (I) diabetes mellitus (defined as a fasting blood glucose level  $\leq$  126 mg/dl or 2 hour postprandial blood glucose  $\geq$  200 mg/dl, or on treatment for diabetes)
  - (II) hypertension (defined as systolic blood pressure  $\geq$  140mmHg or diastolic blood pressure 90 mmHg, or use of antihypertensive medications)
  - (III) history of smoking (any cigarette or beedi smoking in the past one month)
  - (IV) dyslipidemia (defined as total cholesterol  $\geq$  200 mg/dl, low density lipoprotein cholesterol  $\geq$  130 mg/dl, high density lipoprotein cholesterol  $\leq$  40 mg/dl or triglycerides  $\geq$  150 mg/dl as per executive summary of National Cholesterol Education Program Adult Treatment Panel III [2001] guidelines<sup>14</sup>)
  - (V) family history of premature CAD (defined as CAD in male first-degree relative < 55 years and in female first-degree relative < 65 years)

or

2. Age & sex matched individuals with a 10-year risk (Framingham risk score<sup>15</sup>) for developing myocardial infarction / coronary death less than 10% (low risk).

The exclusion criteria were:

1. Individuals with cardiac illness other than aortic stenosis.
2. Individuals on statins for more than 1 year.
3. Individuals with stroke, renal failure, hepatic dysfunction and thyroid disorder.

The 10-year risk for developing coronary artery disease in controls was estimated using an online calculator that could be accessed at '<http://hin.nhlbi.nih.gov/atp/iii/calculator.asp?usertype=prof>'. This risk assessment tool is based on Framingham risk score model. The risk factors included in the calculation are age, gender, total cholesterol, high density lipoprotein cholesterol (HDL), systolic blood pressure, treatment for hypertension, and cigarette smoking. Total cholesterol and HDL values considered for the calculation of risk score were the average of at least two blood analyses for lipid profile. The blood pressure value used was that

obtained at the time of assessment of the individual. An extra point was added if the person was on antihypertensive treatment. The term "smoker" referred to any cigarette or beedi smoking in the past one month or more. The total risk score was the sum of the points for each risk factor.

Informed consent was obtained from the participants. Detailed clinical examinations and routine investigations were performed in all subjects of the study. The routine investigations included hemoglobin, blood urea, blood sugar, serum creatinine, serum bilirubin, serum alanine transaminase, serum thyroid stimulating hormone, urine albumin and urine sugar. CIMT and fasting lipid profile were studied in both the groups.

CIMT was measured at the level of neck using high resolution B mode ACUSON ultrasound machine with 7 MHz linear phased array transducer. The subject was placed in supine position with head turned to the opposite side. A pillow was placed beneath the scapulae to slightly extend the neck and to keep the neck muscles relaxed. The probe was placed medial to the sternocleidomastoid muscle and the common carotid artery was identified. The acoustic impedance between the tissues of arterial wall ultrasonically produced two parallel echogenic lines separated by a hypoechoic space. The first echogenic line was due to lumen-intima interface and the second echogenic line was due to media-adventitia interface. CIMT was measured as the distance between the leading edges of these two echogenic lines in the far wall of common carotid artery, around 10 mm below the bifurcation at end diastole (peak of R wave in electrocardiogram). Longitudinal projections at different angles were utilized to detect the maximal CIMT. CIMT was assessed in both sides of neck and the greater value was chosen

for statistical analysis. Transverse projections were used to quickly scan the carotid arteries from the clavicle to the angle of mandible for luminal plaques. A plaque was defined as a localized thickening of wall of carotid artery greater than 1 mm. All CIMT measurements were performed by a single operator.

Lipid profile was estimated in all subjects of the study using early morning venous blood sample drawn after 12 hours of fasting. In cases with STEMI, lipid profile was studied either within 48 hours or after 8 weeks.

All statistical analyses in this study were performed using Microsoft Excel 2002 and graphPad InStat 3.06 softwares. The comparison between means were analysed using Student's 't' test for unpaired samples or one-way ANOVA as deemed appropriate. Pearson correlation test was used to analyse the correlation between CIMT and HDL in all subjects of the study. A p-value of 0.05 was considered statistically significant.

## Results

A total of 57 individuals were screened with 30 subjects in CAD group and 26 in control group. Out of 30 cases in CAD group, 19 (63.33%) cases were angiographically proven to have CAD and the remaining 11 (36.67%) cases were diagnosed to have new onset STEMI. Within the former subgroup, there were 5 (26.32%) cases of single vessel disease and, 7 (36.84%) cases of double vessel disease and 7 (36.84%) cases of triple vessel disease.

There were 16 (53.33%) males and 14 (46.67%) females in the CAD group while the control group comprised of 14 (55.56%) males and 12 (44.44%) females. All individuals included in this study were from south India. The mean±SD of age was 70.39±4.57 and

Table 1: Baseline characteristics of the groups

Baseline characteristics	CAD group n (%)	Control group n (%)
Age in years (Mean ± SD)*	70.39±4.57	68.92±3.46
Male	16 (53.33)	14 (46.67)
Female	14 (55.56)	12 (44.44)
Smoking	16 (53.33)	4 (14.83)
Diabetes mellitus	18 (60)	-
Hypertension	22 (73.33)	6 (22.22)
Premature CAD in family	1 (3.33)	

\*t=1.357, p =0.1803 using unpaired Student's t test; SD: standard deviation; n: number of individuals

68.92±3.46 years in CAD and control groups respectively (Table 1). There was no statistically significant difference (unpaired Student's t test; t=1.357, p=0.1803) between these groups with respect to age. CAD group consisted of 18 (60%) diabetics, 22 (73.33%) hypertensives, 16 (53.33%) smokers with 10 to 40 pack years and 1 (3.33%) case had family history of premature CAD (Table 1). The control group had 6 (22.22%) hypertensives and 4 (14.81%) smokers with 1.5 to 5 pack years.

Cases in CAD group were on the following medications that could alter lipids. 20 (66.67%) cases were on statins and or fibrates for a duration of less than 3 months, while 10 (33.33%) cases were on these hypolipidemics for more than 3 months but less than 1 year (Table 2). 25 (83.33%) cases were taking b1 blockers and 3 (10%) cases were on diuretics.

**Table 2:** Drugs altering lipids in CAD group

Drug	n (%)
Statins ± fibrates	< 3 months 20 (66.67)
	3 months to 1 year 10 (33.33)
b 1 blockers	25 (83.33)
Diuretics	3 (10)

The measurement of CIMT using carotid ultrasound is shown in Fig.1 and Fig.2. The mean±SD of CIMT was 0.85±0.29 and 0.49±0.07 mm in CAD and control groups respectively (Table 3). The difference in these values were statistically highly significant (unpaired Student's t test; t=6.281, p<0.0001). 6 (20%) cases of CAD group showed carotid plaques while none in the control group had plaque. Using Fisher's Exact test we found that there was significant difference (p=0.0245) between CAD and control group with respect to the presence of carotid plaques.

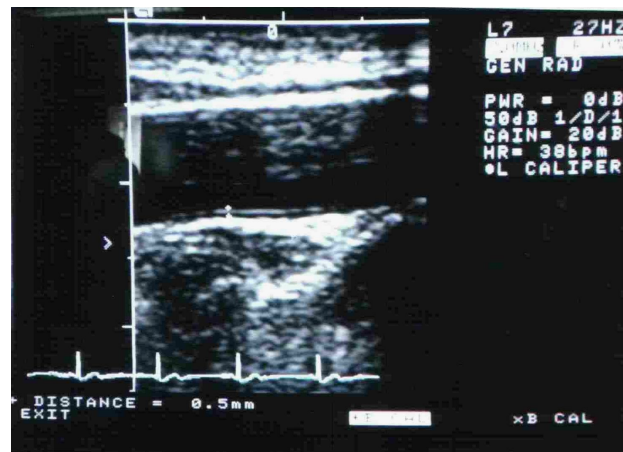
**Table 3:** Carotid intima-media thickness in CAD and control groups

CIMT	CAD group	Control group
Mean ± SD (mm)	0.85 ± 0.29*	0.49 ± 0.07
Range (mm)	0.6 - 1.7	0.4 - 0.6

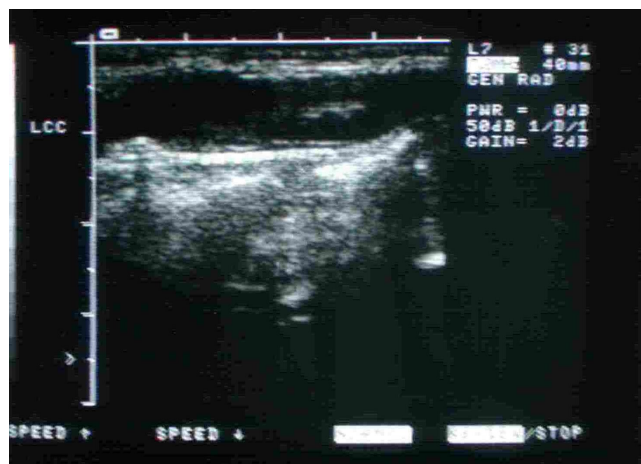
\*t=6.281, p < 0.0001 using unpaired Student's t test;

SD = standard deviation

n = number of individuals



**Fig.1:** Carotid ultrasound showing measurement of carotid intima-media thickness in 68 years male from control group.



**Fig.2:** Carotid ultrasound showing measurement of carotid intima-media thickness in 71 years male smoker with hypertension, diabetes mellitus and coronary artery disease

There were 18 diabetics and 12 non-diabetics in CAD group. The mean±SD CIMT was 0.81±0.26 and 0.91±0.34 mm in these subgroups respectively (Table 4). There was no statistically significant difference (unpaired Student's t test; t=0.942, p=0.3541) between these values.

In our study, the term 'severity' with respect to CAD refers to the number of coronary vessels involved with at least 50% stenosis. Among the angiographically proven cases of CAD, the mean±SD of CIMT was 0.66±0.05, 0.77±0.08 and 1.19±0.33 mm in cases with single vessel, double vessel and triple vessel diseases respectively. One way analysis of ANOVA showed that

**Table 4:** Carotid intima-media thickness between diabetics and nondiabetics in CAD group

CIMT	Diabetics (n = 18)	Nondiabetics (n = 12)
Mean $\pm$ SD (mm)	0.81 $\pm$ 0.26*	0.91 $\pm$ 0.34
Range (mm)	0.6 - 1.7	0.6 - 1.5

\*t=0.9422, p=0.3541 using unpaired Student's t test; SD: standard deviation; n: number of individuals

the difference in these values were statistically highly significant (F=11.221, p=0.0009). The post hoc analysis using Tukey Kramer multiple comparison test was also statistically significant (p<0.05). With increase in severity of CAD, CIMT increased.

Pearson correlation analysis showed that HDL was indirectly correlated to CIMT (r = -0.5605, p<0.0001). With decrease in HDL, CIMT increased.

## Discussion

It was difficult to find adequate number of healthy individuals without any cardiovascular risk factor who were matched for age and sex with the CAD group. So we used Framingham risk score for calculating the 10-year risk of developing myocardial infarction and coronary death.<sup>15</sup> An individual could be assigned to one of the three following categories based on the calculated risk score; high risk (>20%), intermediate risk (10 to 20%) or low risk (<10%) The last category consists of persons having at most one (d"1) risk factor.<sup>14,15</sup> Only individuals of this last category with 10-year risk for CAD less than 10% were included in the control group of our study.

The U.S. Preventive Services Task Force in 2004 recommended against routine screening with resting electrocardiography, exercise treadmill test, or electron-beam computerized tomography scanning for coronary calcium for either the presence of severe coronary artery stenosis or the prediction of CAD events in adults at low risk for cardiovascular events.<sup>16</sup> There are no trials to state that these three screening tests provided additional prognostic information beyond the currently used risk factor calculations. Moreover, these tests are inaccurate in predicting CAD events as many acute CAD events result from sudden occlusion of a previously unobstructed coronary artery. The American College of Cardiology/American Heart Association gave a class

III recommendation for screening with exercise testing in asymptomatic persons without CAD.<sup>16</sup> Therefore, in our study the participants of control group were not subjected to these screening tests.

In the CAD group, two third of the cases were angiographically proven to have CAD. Since STEMI occurs as a result of occlusive thrombosis of coronary artery, cases with STEMI were also included in the CAD group.

In this study, control group was matched with CAD group with respect to age and sex. It is a well known fact that the incidence of cardiovascular events in postmenopausal women paralleled that of men of the same age group. This fact was also observed in our study. There was no gender disproportion in our study with elderly individuals.

Prior studies gave no unanimous opinion about the cut off value of CIMT for detecting CAD. According to one study conducted in Japanese diabetics, CIMT  $\geq$  1.1 mm represents CAD.<sup>11</sup> The average and maximum CIMT for normal Indian population is 0.67 mm and 0.80 mm respectively, while the same for CAD in India is 0.82 mm and 1.02 mm.<sup>12</sup> There is one more study which states that the risk of first myocardial infarction increases with a CIMT  $\geq$  0.822 mm.<sup>13</sup> In our study, the normal range (mean $\pm$ SD, 95% confidence interval) of CIMT for healthy elderly south Indian population was from 0.35 to 0.63 mm. We took CIMT > 0.63 mm as the surrogate marker of significant coronary atherosclerosis and found that the sensitivity, specificity, positive predictive value and negative predictive value for detecting CAD in elderly south Indians using this value as the cut off was 80%, 100%, 100% and 81.82% respectively. The probable explanation for a lower cut off value in our study is that other studies had matched cases and controls with respect to risk factors. On the contrary, the controls in our study were all healthy elderly individuals without any risk factor for CAD and they were matched with cases in age and sex only. Another explanation could be that South Indians have a lower CIMT.

There are studies where at least 6 readings of CIMT were measured in each side of neck and from these values the average and maximum CIMT were calculated for each side.<sup>10,12</sup> They had chosen the greater value of average and maximum CIMT between both sides for statistical analysis. In our study, we took multiple measurements of CIMT on either side of the

neck. From these values we chose the maximum CIMT for each side. Finally the greater CIMT between both sides was taken into consideration for statistical analysis. All CIMT measurements were performed by a single operator to avoid interobserver variation.

Recently, CIMT has been proposed as a strong predictor of disease in the mid and distal segments of coronary arteries, but a much weaker predictor of disease in the proximal segments, including the left main coronary artery.<sup>23</sup> We have not done such an analysis in this study.

As per Adult Treatment Panel III guidelines, diabetes mellitus is considered CAD equivalent.<sup>14</sup> So CIMT is expected to be greater in diabetics compared to non-diabetics.<sup>11</sup> This variation must be even more in diabetics with CAD when compared to non-diabetics. In our study, there was highly significant difference in the overall CIMT between CAD and control groups. There was no significant difference in CIMT between diabetic and non-diabetic subgroups within the CAD group. This observation could be because of the simple fact that the quantum of atherosclerosis for developing CAD will not differ between diabetics and non-diabetics.

Actually, severity of CAD depends on the degree of stenosis, the number of coronary arteries involved and the type of coronary artery involved. As mentioned earlier, in our study the term 'severity' of CAD referred only to the number of coronary arteries having at least 50% of stenosis. We did not take into consideration the degree of stenosis beyond 50% and the type of coronary artery involved. There was a significant difference in CIMT among cases with single vessel, double vessel and triple vessel disease within the CAD group. With increase in severity of CAD, CIMT increased. Except for one study, which found a significant but weak correlation between CIMT and severity of CAD<sup>3</sup>, our observation is consistent with most other studies.<sup>11,24</sup>

In our study, significant carotid plaques were detected in one third of cases of CAD group. None of those in the control group had plaque. Hence the presence of carotid plaques in combination with increased CIMT can be a surrogate marker of CAD.<sup>2,3,10</sup> Though studies have compared the utility of carotid plaques over increased CIMT, we have not done such an analysis in our study. We have also not studied about the peak systolic velocity in the carotid artery.

CIMT tends to be larger in individuals with high

cholesterol levels than those with normal lipid levels or elevated triglyceride levels.<sup>19</sup> It is needless to say that lipid levels alter with variation in ethnicity. Studies done earlier have shown that low HDL is the predominant abnormality in south Indians with CAD.<sup>20,21</sup> Hence we tried analyzing the relation between CIMT and HDL in all subjects of the study who were all elderly south Indians. Interestingly, we found that CIMT was indirectly correlated to HDL. With decrease in HDL, CIMT increased. There was one study which showed that with decrease in prebeta fraction of HDL, CIMT increased.<sup>22</sup> We did not analyse the subfractions of HDL.

It is well known that desirable and sustained alteration of lipid levels in blood occur only when hypolipidemic medication such as statins or fibrates are consumed regularly for at least 3 months. In our study, around two-third of the cases had taken statins and or fibrates for less than 3 months. Moreover, the predominant statin consumed in more than 90% of cases was atorvastatin with a dose range of 10 to 20 mg/day. Therefore, the shorter duration of treatment and a lower dose range of atorvastatin would not have produced significant and sustained changes in the lipid levels of CAD group. There were 14% of cases who took fenofibrate at a mean dose of 200 mg/day. Once again this dose is low to produce any effective change in blood lipid levels.

CIMT is a noninvasive and simple investigation. Though coronary arteries are not visualised directly, CIMT is more applicable and repeatable than angiography. Coronary angiography may be misleading in the initial phases because of the abluminal enlargement of the atherosclerotic lesion. It also has a limited angle of interrogations and changes in vascular tone may affect the interpretation of angiography. There is no limitation for varying the interrogation angles in B mode ultrasound because carotid arteries are relatively stationary when compared to the coronary bed. The accumulating knowledge that risk factors of coronary and carotid are different is a major cause of concern.

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# A Study of Health Problems and Loneliness Among Agriculture Labourers in Karnataka

Chandrashekar, Shekara

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## Introduction

From the beginning to the end of the 20th century, human life expectancy at birth has almost doubled in developed countries with the increased life expectancy leading to considerable increase in elderly population worldwide. Projections indicate that by the year 2020, there will be 470 million people aged 65 and above in developing countries, more than double the number in developed countries.<sup>1</sup> The growth projected for older populations in developing countries is far greater and has considerable implications for health and social policy. The age structure of the population is changing as the proportion of elderly persons is increasing. With ongoing economic development and the consequent changes in family structure and relationships, the elderly lose their relevance and significance in their own households and face problems. The problems of the aged differ not only between nations but also within nations and between groups. Being old, weak, hard of hearing, partially blind and immobile, the aged seldom move out or approach for help and consultation. They are superficially respected, cared for and heard. Due to the above problems, the aged feel lonely and this has detrimental influence on health of the aged (both sexes); and also, loneliness leads to progressive spontaneous reduction of daily milieu and social requirements, as well as an impression of dependence that cannot be easily overcome.

With this background, the present study was undertaken in the rural Karnataka to study the health-related problems and loneliness among the agriculture labourers in different micro-environment groups.

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## Material and Methods

A total of 361 aged persons of age 65 years and above were selected as sample from rural Karnataka. A stratified random sampling technique was used to select the sample. The houses to be taken up for survey in each sector were decided on the basis of voter list using the random number table. The investigator visited each of the selected houses; if husband and wife were found to be of age 65 years and above, then both were included in the study. To ensure cooperation, at least half an hour was spent, prior to getting the information, to build a rapport and create an atmosphere of trust and confidence. The information for the study was collected using the Upmanyu and Upmanyu loneliness scale and a semi-structured interview schedule for health-related problems.<sup>2</sup>

## Results

Out of the total 361 aged persons, 152 were males and 209 were females. The age of the study population ranged from 65 years to 92 years. It was also observed that 213 (59%) of them were married, 142 (39.3%) were widows/widowers, 2 (0.6%) were separated/divorced and only 4 (1.1%) were unmarried; 33.5% were illiterates and 28% were graduates/ postgraduates/ professionals. From the total 361 aged persons, 311 (86.1%) reported one or more health-related complaints, with an average of two illnesses. Among the 311 ill persons, illness was higher among females (59.5%) as compared to males (40.5%).

The main health-related problems among the aged were those of the circulatory system (51.2%), with about two-fifths (41.6%) suffering from hypertension, followed by those of the musculoskeletal system and connective tissues disorders (45.7%); cataract was seen in 18.6%. Hypertension was the most prevalent condition, and it was significantly more in females (46.4%) than in males (34.9%) ( $P < 0.05$ ). Also, diabetes mellitus was significantly more in females (18%) than in males (6.4%) ( $P < 0.05$ ). (Table 1)

Table 1: Gender-wise health related problems of the aged

Area	Sex		Total
	Male	Female	
	n=152 %	n=209 %	
Health problem/system affected			
Diabetes mellitus	8 5.3	35 16.7	43 11.9
Cataract	30 19.7	37 17.7	67 18.6
Circulatory system	76 50.0	109 52.1	185 51.2
Hypertension	53 34.9	97 46.4	150 41.6
IHD	23 15.1	12 5.7	35 9.6
Digestive system	19 12.5	25 12.0	44 12.2
Respiratory system	17 11.2	20 9.6	37 10.2
Musculoskeletal system & connective tissue disorders	64 42.1	101 48.3	165 45.7
Skin	7 4.6	8 3.8	15 4.2
Others	28 18.4	31 14.8	59 16.3

The health-related problems in relation to circulatory system were higher in females (56.9%) in the "65+ years" age group as compared to males (52.1%) in the same age group. The disorders of the musculoskeletal system and connective tissue were also higher in females (49.4%) in the "65+ years" age group as compared to the males (39.4%) in the same age group. However, this problem was almost similar in either sex (about 45%) in the age group of "75+ years."

#### Living arrangement in different micro-environments

Out of the 361 aged persons, only 352 (97.5%) who were living in five different micro-environment groups for the elderly were taken for analysis of the data as the other 9 persons were living with their distant relatives. From these 352 persons, 13 (3.7%) were living alone, 35 (0.9%) were living with their spouse, 175 (49.8%) couples (husband and wife) were living with their family and 94 (26.7%) widows and 35 (9.9%) widowers were living with their family.

It was observed that females had higher (72.8%) mean score on loneliness than males (65.61) ( $P < 0.05$ ), and this was also higher (77.73%) among the "75+ years" age group than among the "65+ years" age group (66.75%) ( $P < 0.001$ ).

Loneliness mean score (92.1%) was significantly higher among the aged who lived alone as compared to that among those who lived with their spouse (58.8%) ( $P < 0.01$ ) or those couples who lived with their family (61.3%) ( $P < 0.01$ ). It was also higher among the widows (85.2%) ( $P < 0.01$ ) and widowers (75.7%) ( $P < 0.01$ ) who lived with their family as compared to the aged who lived with their spouse and the aged couples who lived with their family.

Loneliness mean score was higher among the females as compared to the males who lived alone ( $P < 0.05$ ). It was also higher among the widows as compared to widowers who lived with their family ( $P < 0.05$ ). No gender-wise differences were observed among the aged who lived with their spouse or the couples who lived with their family. (Table 2).

#### Discussion

In most developed countries, there are about 65 men for every 100 women in the age group of 65 years and above according to WHO.<sup>3</sup> In India, there are 108 men for every 100 women; and in Karnataka, it is 116

Table 2: Gender-wise differences with respect to loneliness within different micro-environments

Sex	Micro-environment groups											
	I Live alone		II Live with spouse		III H/W live with family		IV/V Widow/widower live with family					
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Male	5	82.00	29.73	16	53.75	13.55	88	63.20	24.87	35	75.71	23.95
Female	8	98.50	29.84	19	63.16	23.17	87	59.46	23.00	94	86.18	25.61

men for every 100 women of age 65 years and above.<sup>4</sup> In most developed and developing countries, many more women than men are widowed as per WHO.<sup>3</sup> A high percentage of widows (49.3%) and widowers (25.7%) were observed in the present study. It is due to the fact that the longevity of females is more than that of males. Of the total 361 elderly persons studied, >80% had one or more health-related problems.<sup>5</sup> There were on an average 2 health-related complaints per aged ill person.<sup>6</sup> The leading health-related problems observed were those of the circulatory system (hypertension, heart attack), musculoskeletal system, connective tissue, eye (cataract), diabetes mellitus, those of respiratory system and skin. About 18.6% aged persons had cataract in one or both the eyes. The prevalence of diabetes mellitus was found to be 11.9% in the aged persons, and it was significantly more in females than in males; whereas Weinberger reported almost half of diabetics were aged 65 years or above, with an approximately equal distribution between men and women.<sup>7</sup> Diseases of the respiratory system were found in 10.2% of the aged persons. A low prevalence of respiratory diseases in Chandigarh may be due to the fact that the city is well planned and has a comparatively lower level of air pollution. Diseases of the circulatory system were present in 51.2% of the aged persons in the present study. Hypertension was the most prevalent condition, in 41.6%, and it was more in females (46.4%) than in males (34.9%). Heart disease was found in 9.6% of the aged persons in this study. A study was conducted recording ECG test on the elderly and reported 32.5% individuals having this abnormality in Chandigarh. The difference between the two studies was that in the present study, the patients only reported the disease; but in the other study, the disease was investigated and abnormality was found, about which the patient was aware/unaware.

Out of the 361 aged persons, only 352 were studied for loneliness - living in five different categories - as the marital status and living arrangement of an individual can play an important role in the later years of life.<sup>8-9</sup> It was found that loneliness mean score was significantly higher in females as compared to males. Studies by Gangrade and Singh have reported more loneliness in females than in males.<sup>10</sup> Contributory factors for higher loneliness in females were loss of companion, illiteracy, less social contacts and maltreatment by the family members. It has been found that loneliness was significantly higher among the aged

who were living alone as compared to those who were living with spouse, or couples who were living with the family. It is due to the fact that though the widows/widowers live with their families, they are maltreated/ignored in their own homes. Being single, without the life partner, it is not possible for them to discuss their personal problems with others. Gurudas observed that men who lived with their spouse had more satisfaction with life than those who had lost their wife.<sup>8</sup> Isolation was more prevalent among the widowers than among the married ones. Loneliness was also significantly lower in the aged couples who were living with the family as compared to the widow/widowers who were living with the family. Nayar observed that aged living with the family were happier than those living alone.<sup>9</sup> Therefore, it can be seen that the aged who were living alone or those who were widows/widowers were experiencing more loneliness than the aged who were living with their life partner. Keeping in view the magnitude of health-related problems and loneliness in agriculture labourers in Karnataka, it is recommended that geriatric health services should be strengthened by dedicated indoor and outdoor services in different health-care delivery systems with more social and recreational facilities for them.

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# Balance Confidence in Indian Community Dwelling Older Adults

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## ABSTRACT

**Background and Purpose:** Poor balance confidence has been recognized as an intrinsic factor of falls that leads to restriction of daily activities thereby affecting the quality of life of older adults. The aim of this study was to investigate the balance confidence in Indian community dwelling older adults and its influence on performance of daily activities.

**Methods:** Sixty older adults above 65 years of age volunteered to participate in the study. Mean age of the participants was 74.28 years (S.D=6.90). Balance confidence was determined using the Balance Confidence Scale which was administered through personal interview. The mean balance confidence was then categorized on the basis of severity as low (0%-30%), medium (31%-60%) and high (61%-100%).

**Results:** Five percent Indian community dwelling older adults reported low balance confidence, 23.33% reported medium and 71.67% reported high balance confidence. Analysis of balance confidence on individual activities showed that older adults reported lower balance confidence on community mobility activities like going to hilly areas (31.67%), walking in crowd (26.67%) and crossing a road (25.0%).

**Conclusion:** The study suggests that Indian community dwelling older adults report decreased confidence in activities of community mobility, which may hinder their participation in social activities; which is essential to promote active ageing and improve the quality of life. An early screening of balance confidence and its influence on activity participation is essential in fall risk assessment. Intervention strategies directed towards intrinsic factors along with modification in the attributed environmental factors may enhance balance confidence and reduce risk for falls in older adults.

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## Introduction

Falls are common, disabling and frequently fatal events affecting between 30% and 50% of older individuals annually<sup>1</sup>. Studies in the community indicate that >30% of older people fall at least once a year and many have multiple falls. Fall prevalence in Indian older adults ranges from 14 % to 51%<sup>2-5</sup>. The consequences of falls range from physical (serious injuries, fractures, various medical problems), social (limiting interaction with others, isolation), economic (dependence on others, medical expenses), functional

(limitation of activities) and psychological. Falls can have physical, psychological and functional changes in older adults<sup>6</sup>. Thus, falls present a major threat to the well-being and quality of life of older people.

Psychological trauma often referred to as Fear of Fall (FOF) may develop after a fall, and lead to self-imposed restriction of activity and loss of confidence, despite the fact that the injuries experienced may not be functionally limiting. FOF may lead to avoidance of activities for seniors, even though they may be able to perform these activities. Activity restriction may also lead to other negative outcomes, such as balance deterioration, functional decline, emotional/psychological changes (i.e., anxiety) or decreases in social contacts or leisure activities<sup>7</sup>. Fear Of Falling (FOF) has been identified relatively recently as a risk factor in the fall prevention literature. Ozcan et al. (2005) found that risk

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factors for falls (balance, functional mobility, muscle strength, fear of falling) are associated with quality of life<sup>8</sup>. Several studies have confirmed that FOF is associated with poor health status and functional decline.

FOF is widespread and has been reported as the most common fear of older adults. In a study on Indian community dwelling older adults, FOF was reported in 29.7% of Indian older adults without history of fall and 52.8% in older adults with history of fall<sup>2</sup>. Tinetti & Powell (1993) have described FOF as an on going concern about falling that ultimately limits the performance of daily living activities<sup>9</sup>. It is also referred to a patient's loss of confidence in his /her balance abilities. Rather than assessing global FOF, it is recommended to assess Balance confidence or self-efficacy in performing specific activities or tasks, as it should reveal the extent to which a person believes he/she is able to participate in specific activities without falling<sup>10</sup>. The observed associations of FOF with decreased quality of life and mobility confirm the need for effective interventions to prevent and limit the consequences of falls in elderly persons<sup>11</sup>. Thus, understanding the dynamics of balance confidence is important to identify effective intervention strategies towards reducing this risk factor.

## Aim of the Study

The aim of this study was to investigate the balance confidence in Indian community dwelling older adults and its influence on performance of daily activities.

## Methodology

### Participants

Sixty Indian community dwelling older adults aged above 65 years were conveniently selected. Older adults who were ambulant with/without the use of walking aid or physically related personal assistance, able to hear when the administrator spoke in a normal voice from a distance of 1 meter with/without hearing aid and were able to comprehend the administrator's commands were included in the study. The *exclusion criteria* were: being home bound, being institutionalized and being wheelchair bound. The older adults were explained the objective of the study and an informal consent for interview was obtained.

### Study Design

In a semi-structured interview, information was

obtained about age, sex, marital status, use of any walking aid. The older adults were queried for recent fall history and the number of falls in the past one year. A dichotomous question was asked regarding presence/absence of fear of falling and whether it has resulted in activity restriction. In addition, medical history related to health conditions and medications taken on regular basis was obtained.

### Measure

The Balance Confidence Scale (BCS) is a scale that assesses balance confidence in the Indian community dwelling older adults. BCS has high test-retest reliability ( $r=0.93$ ,  $p<0.001$ ), high internal consistency ( $\alpha=0.97$ ) and high reliability on phone ( $r=0.96$ ,  $p<0.001$ ). It is an activity-based with items/activities representing a wide spectrum of activities and inclusive of various performance areas: self-care, transfers, basic mobility, and community mobility. BCS was administered through a structured interview to determine the balance confidence of older adults. The Net balance confidence is calculated for older adults individually by adding the response on the 22 items of BCS and dividing the sum by 22.<sup>5</sup> BCS was administered in English on 57% of the sample, 25% in Hindi and 18% in Kannada.

### Statistical methods to analyze the data

Descriptive analysis was performed on all subject characteristic variables and ratings. Also, the mean of ratings given by the 60 older adults on each item of BCS was calculated for analysis of their level of perceived balance confidence on respective activity. The Net balance confidence scores were then categorized on the basis of degree of balance confidence as low (0%-30%), medium (31%-60%) and high (61%-100%). Statistical Package for the Social Sciences (SPSS) for Windows version 10.0 was used for all analysis.

### Results

In the present study, 60 Indian community-dwelling older adults participated. The age of older adults ranged from 65 to 92 years of age (mean age =  $74.3 \pm 6.9$  years). The present study had larger proportion of men i.e. 78% with mean age of  $75.1 \pm 6.8$  years. The mean age of female older adults was  $71.3 \pm 6.7$  years.

The mean of balance confidence ratings given by the 60 older adults on each item of BCS arranged in descending order is shown in Table 1. The mean level of balance confidence ranged from  $57 \pm 35.5\%$  on item

**Table 1:** Description of Respondents' Performance on Items of BCS (with mean level of confidence arranged in descending order for all 60 respondents)

BCS Item No	Component/Activity on BCS	Mean Balance Confidence	S.D.
2	Getting in and out of a chair	85.50	25.85
17	Walking around the house	82.58	26.99
7	Using the toilet	82.50	30.72
1	Getting in and out of bed	80.92	27.08
5	Bending over to pick up an object from floor	79.50	28.52
8	Putting footwear while standing without support	78.92	31.22
4	Taking bath while standing	77.75	32.71
11	Coming down the stairs	75.92	30.36
21	Going to public places	75.50	30.69
18	Going to a store/shop	75.42	32.67
10	Climbing up the stair	75.25	30.20
12	Walking up/down the slope	69.17	33.60
3	Standing from sitting on the floor	67.42	39.24
9	Lower extremity dressing while standing	67.00	38.31
19	Walking in a crowded place	66.17	36.50
22	Using community transport	65.75	34.29
20	Crossing a road	65.08	34.96
16	Walking in the dark	63.92	32.90
6	Reaching overhead tiptoeing or using stool	63.33	37.62
14	Walking on uneven road	63.33	29.27
13	Walking on slippery surface	63.17	31.10
15	Walking in hilly areas	57.33	35.52

Note: Items were rated from 0 % (no confidence) to 100 % (complete confidence).

15 (walking in hilly areas) to  $85.5 \pm 25.8\%$  confidence on item 1 (getting in and out of the chair). The respondents reported minimum balance confidence on item 15 i.e. walking in hilly areas ( $57.3 \pm 35.5\%$ ), followed by item 13 i.e. walking on slippery surface ( $63.2 \pm 31.1\%$ ). These were followed by item 14 i.e. walking on uneven road ( $63.3 \pm 29.2\%$ ), item 6 i.e. reaching overhead ( $63.3 \pm 37.6\%$ ), and item 16 i.e. walking in the dark ( $63.9 \pm 32.9\%$ ) (Fig.1).

Analysis of balance confidence scores of the older adults on BCS was done according to the degree of Net balance confidence reported by them under three categories: 0-30% (Low), 31-60% (Medium), 61-100% (High) (Table 2). Five percent Indian community dwelling older adults reported Net balance confidence lying between 0% to 30% i.e. low balance confidence. Medium Net balance confidence i.e. between 31%-60% was reported by 23.33%, and high Net balance confidence i.e. between 61%-100% was reported by 71.67% older adults. Characteristics of the older adults

in these three different groups are presented in Table 2.

Analysis of the ratings given by the 60 older adults on each of the 22 activities of BCS was done (Table 3). Percentage of older adults reporting low balance confidence (0%-30%) was maximum on walking in hilly areas i.e. 31.67% older adults, 26.67% older adults on walking in crowd and 25.0% older adults on crossing a road. This indicates their concern regarding falling during these activities indicates their difficulty in community mobility activities. High balance confidence (61%-100%) was reported by older adults on activities like getting in and out of a chair (80.0%), using the toilet (80.0%), walking around the house (78.33%), getting in/out of the bed (73.33%), putting on footwear while standing without support (73.33%). Most of these activities belong to self care and basic mobility areas of performance.

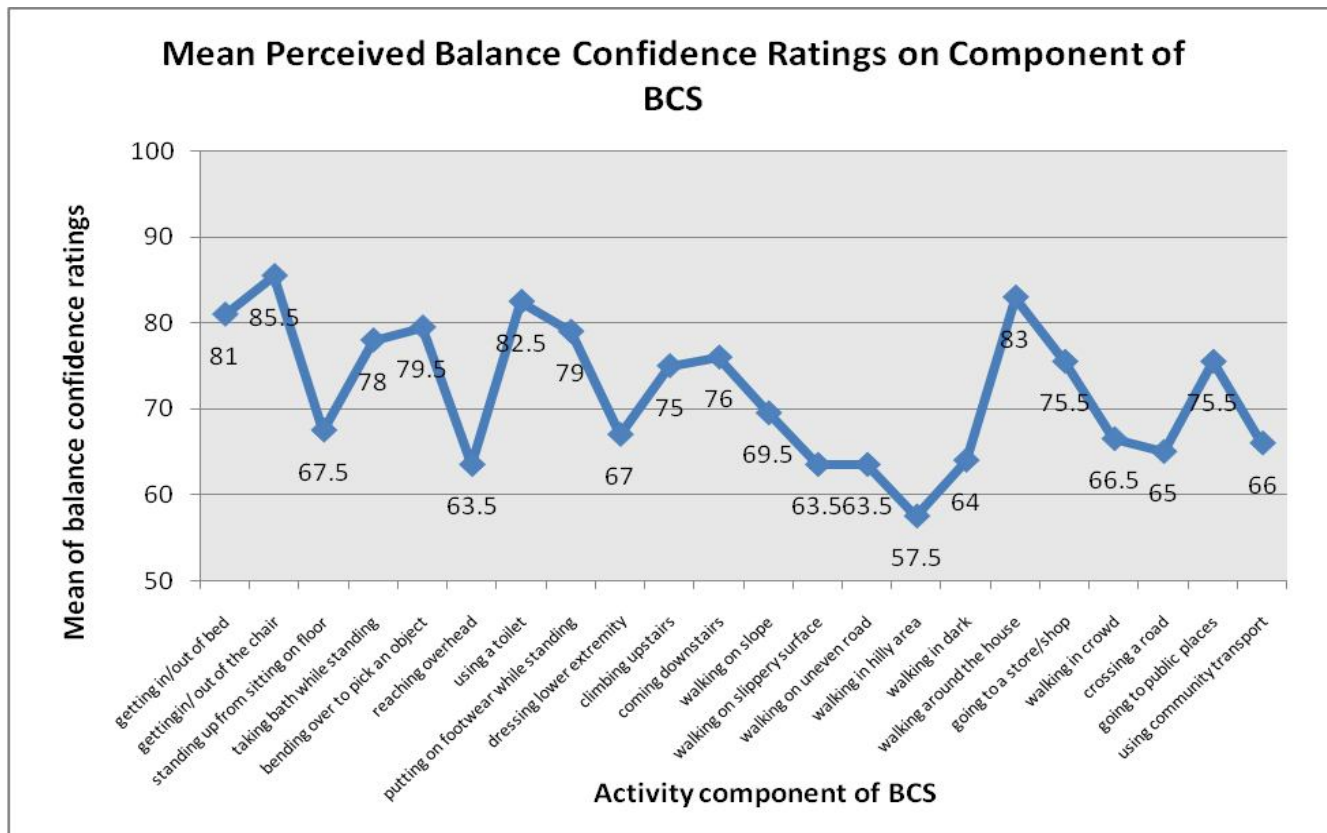
## Discussion

The older adults reported minimum mean balance

**Table 2:** Characteristics of older adults on basis of Net Balance Confidence

S.No.	Characteristic	The degree of Net Balance Confidence Older Adults on BCS		
		Low	Medium	High
1	Number of older adults	3	15	42
2	Percentage of older adults	5%	23.33%	71.67%
3	Mean age (Years)	77.33	75.5	73.62
4	Age range(Years)	68-82	65-92	65.5-86
5	Sex	2M,1F	7M,6F	36M,6F
6	No. of older adults using walking aids	3 (100%) (2 sticks, 1 walker)	12 (80%) (10 sticks, 1 tripod 1 walker)	12 (28.57%) (12 sticks)
7	Use physical assistance	3 (100%)	2 (13.33%)	4 (9.5%)
8	History of falling	3 (100%)	9 (60%)	18(42.86%)
9	No. of falls in past one year	1-3	1-5	1-3
10	Affirmative on dichotomous question about FOF	3 (100%)	12 (80%)	7 (16.67%)
11	Activity Restriction	3 (100%)	11(73.33%)	7(16.67%)
12	No. of activities restricted	10-17	3-13	0-13
13	Mean Net Balance Confidence Score	6.44%	44.47%	80.91%
14	Range of Net Balance Confidence Score(%)	2.73-10.23	31.14-57.5	64.55-100
15	No. of health problems	2-6	1-7	0-15
16	No. of older adults taking e"4medications	3 (100%)	4(26.67)	15(35.71)

**Fig. 1:** Mean level of balance confidence ratings on each activity of BCS



**Table 3.** Distribution of Reported Balance Confidence on Individual Activities

S.No.	Activity	Percentage of older adults according to their response on BCS		
		0%-30%	31%-60%	61%-100%
1	Getting in and out of bed	06.67	20.00	73.33
2	Getting in and out of a chair	05.00	15.00	80.00
3	Standing from sitting on the floor	21.67	18.33	60.00
4	Taking bath while standing	15.00	13.33	71.67
5	Bending over to pick up an object from floor	10.00	20.00	70.00
6	Reaching overhead tiptoeing or using stool	23.33	25.00	51.67
7	Using the toilet	10.00	10.00	80.00
8	Putting footwear while standing without support	13.33	13.33	73.33
9	Lower extremity dressing while standing	23.33	13.33	63.33
10	Climbing up the stair	13.33	15.00	71.67
11	Coming down the stairs	11.67	16.67	71.67
12	Walking up/down the slope	18.33	21.67	60.00
13	Walking on slippery surface	20.00	30.00	50.00
14	Walking on uneven road	18.33	33.33	48.33
15	Walking in hilly areas	31.67	26.67	41.67
16	Walking in the dark	21.67	25.00	53.33
17	Walking around the house	06.67	15.00	78.33
18	Going to a store/shop	15.00	15.00	70.00
19	Walking in a crowded place	26.67	15.00	41.67
20	Crossing a road	25.00	25.00	50.00
21	Going to public places	13.33	21.67	65.00
22	Using community transport	21.67	21.67	56.67

confidence on item 15 i.e. walking in hilly areas ( $57.3 \pm 35.5\%$ ), followed by item 13 i.e. walking on slippery surface ( $63.2 \pm 31.1\%$ ). These were followed by item 14 i.e. walking on uneven road ( $63.3 \pm 29.2\%$ ), item 6 i.e. reaching overhead ( $63.3 \pm 37.6\%$ ), and item 16 i.e. walking in the dark ( $63.9 \pm 32.9\%$ ) (Table 1). Most of these were components of community mobility. In addition, reaching overhead tiptoeing or using stool (component of basic mobility), lower extremity dressing while standing (component of self-care), and standing from sitting on the floor (component of transfers) were other activities in which the mean balance confidence was less than 70%.

The Net Balance Confidence of the older adults ranged from 2.7% to 100% on BCS. Considering a large variation in the Net balance confidence ratings reported by the older adults, the ratings were analyzed under three categories of balance confidence: low balance confidence (0%-30%), medium balance confidence (31%-60%) and high balance confidence (61-100%). Five percent Indian community dwelling older

adults reported low balance confidence, 23.33% reported medium, and 71.67% older adults reported high Net balance confidence (Table 2).

Hundred percent older adults responding low net balance confidence on BCS used walking aids as well as physical assistance both inside and outside the home. The percentage of older adults using walking aids was reasonably high in medium balance confidence group than the high balance confidence group (28.57%) (Table 2).

History of falls in the past year showed a similar trend with 60% older adults from medium balance confidence group having history of fall (Table 2). The response to dichotomous question regarding fear of falling was affirmative for all the older adults with low perceived balance confidence (0%-30%). Eighty percent older adults of those with medium net balance confidence score accepted that they were afraid of falling. Whereas it was only 16.67% from the high balance confidence responding older adults (Table 2). The number of health problems in the high balance confidence group ranged

from no health problem to 15. The range was two to six in the low and one to seven health problems in the medium balance confidence responding group. All the three older adults in the low balance confidence group reported taking four or more medications (Table 2). Thus, a higher number of predisposing factors and comorbidities to falls in older adults were seen in the medium balance confidence group along with the low balance confidence group.

The percentage of older adults reporting low balance confidence (0%-30%) was maximum on walking in hilly areas (31.67%), walking in crowd (26.67%) and on crossing a road (25.0%) (Table 3). Older adults reporting medium balance confidence (31-60%) also seemed to have decreased balance confidence in the same areas; Walking in the dark (25%), walking in hilly areas (26.67%), walking on uneven road (33.33%), walking on slippery surface (30%) and reaching overhead (25%) (Table 3). A considerable percentage (80%) of this group reported global FOF. Older adults reporting balance confidence in this range are more vulnerable to decrease in balance confidence, especially if they have history of fall and other fall risk factors. Fall risk screening and intervention/prevention strategies must be specifically targeted for this group.

All the above indicate that poor balance confidence was reported on activities like walking on hilly areas, walking on slippery surface, walking on uneven road, reaching overhead, walking in the dark and walking in a crowded place. These activities are mostly components of community mobility area of occupational performance. This suggests that community mobility is the area of maximum difficulty or concern regarding balance confidence in the Indian community dwelling older adults followed by basic mobility and transfers. This could probably be due to inadequate community facilities such as uneven road surfaces and pavements, poor illumination etc. Outdoor falls among adults aged 45 years and older were frequently attributable to modifiable environmental factors.<sup>12</sup> A survey on falls and related factors in Indian older adults done by D'Souza, Shringarpure & Karol (2007) also concluded that most outdoor falls are precipitated by environmental factors, such as uneven surfaces and tripping or slipping on objects, and usually occurred in sidewalks, curbs and streets.<sup>2</sup>

Outdoor falls are an important but neglected public health problem. Many of the environmental risk factors associated with outdoor falls appear to be preventable

through better design and maintenance of sidewalks, curbs, walkways, streets, outdoor parks and recreational places, and parking lots and garages. Li *et al.*, (2006) suggest that with the widespread promotion of active lifestyles among older people, improvement in their outdoor environment are urgently needed.<sup>12</sup> In this decade of worldwide promotion of active living and active aging, efforts have begun at the national, state, municipal, and community levels to improve the built environment, including making neighborhoods more walkable.<sup>9</sup> Preventing falls among older persons should be included in these efforts. The low balance confidence in areas of community mobility reported by respondents of this study also support suggestion to improve out-door environment for older adults.

Fuller (2000) has recommended providing opportunities for socialization and encouragement as a step to reduce risk of falls.<sup>13</sup> Thus, intervention strategies directed towards intrinsic factors along with modifications in the community like proper illumination, leveling of roads, and removal of architectural barriers (reduction of height of step of buses, removal of stairs and steps in the community places like bus stops and places of worship etc.) may enhance balance confidence of older adults and thus reduce the risk for falls. This in turn will enhance social participation and improve the quality of life of Indian older adults. Research has consistently demonstrated the importance of social and family relationships in the definition of a 'good quality of life'.<sup>14</sup>

## Conclusion

This study helped to identify the specific activities that Indian community dwelling older adults report decreased balance confidence. Community mobility was reportedly the activity that they primarily had decreased confidence, followed by some activities of self-care (lower extremity dressing), and basic mobility (reaching overhead) and transfers (standing from sitting on the floor).

Decreased balance confidence in activities of community mobility, may hinder participation in social activities; which is essential to promote active ageing and improve the quality of life. An early screening of balance confidence and its influence on activity participation is essential in fall risk assessment. Intervention strategies directed towards intrinsic factors along with modification in the attributed environmental factors may enhance balance confidence, reduce risk for falls and promote activity participation in older adults.

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# Pattern of Tobacco Consumption Among Elderly

Preeti Soni

## Abstract

Drug abuse is one of the biggest anathemas the modern society has come across. Interaction between social and economic parameters are proving to be breeding grounds for many other social problems, physical strains and psychological stresses. These endogenous and exogenous factors give rise to variety of problems to the children, women and also on elderly. The process of industrialization, urbanization and democratization has a negative influence on the elderly in which drug abuse is the one. They often suffer from the feelings of worthlessness, isolation, helplessness, insomnia, anxiety, death of spouse, retirement blues, which is mainly contributing to the proliferation of drug abuse. Thus, the present paper aimed to explore various problems and issues related to tobacco consumption among elderly. The main focus is to examine the types of tobacco consumption and its effects on the health of elderly. The result reveals that tobacco consumption among elderly is the matter of great concern. Majority of the elderly are well aware of the risk factors and consequences but are still not able to quit tobacco intake.

(Journal of The Indian Academy of Geriatrics, 2008; 4:156-160)

## Introduction

Tobacco use has been prevalent across all societies. The pattern of tobacco use varies depending on religion, education, types and other socio-demographic characteristics. Tobacco use is increasing in developing countries, but not much has been done on this sector. Since 1970, 47% of developing countries have increased their consumption of tobacco per adult (WHO, 1999). Statistics from the Centers for Disease Control and Prevention indicates that tobacco use remains the leading preventable cause of death in the United States, causing approximately 440,000 premature deaths each year and resulting in an annual cost of more than \$75 billion in direct medical costs attributable to smoking. Over the past four decades, cigarette smoking has caused an estimated 12 million deaths, including 4.1 million deaths from cancer, 5.5 million deaths from cardiovascular diseases, 2.1 million deaths from respiratory diseases, and 94,000 infant deaths. Tobacco is the 1<sup>st</sup> killer of the world, it is found that number of deaths due to tobacco will increase from 3 million per year worldwide to 70 million per year by 2025.<sup>1</sup> Actually, drug is a pharmaceutical preparation

or naturally occurring substance used primarily to bring about a change in physiological and psychological or bio-chemical function of human body. It is the problem or part of the larger problems of disease, poverty, unemployment, violence, economic disparity and styles of living. In India, the use of tobacco is considerably more common than the use of other drugs. According to WHO, by 2020 the tobacco consumption will be causing an estimated 13.3% of all deaths in India.

### ***Magnitude of the problem***

It was the Portuguese sailors, who brought tobacco to India, sometime in the 16th century. Soon they offered this 'uplifting substance' to Emperor Akbar. There was a heated debate in the court on how the king could inhale this unknown substance. The royal hakim came up with a compromise formula. The king will smoke, he ruled, only if the smoke passes through water. And that was how hookka was invented.

The addiction to nicotine grew fast. The Emperor must have been followed by his court and emulated by his subjects. By the time of Akbar's son Jahangir, tobacco cultivation had spread in India. Jahangir taxed tobacco and found a fabulous source of state revenue. Since then, all governments have followed Jahangir. The Indian Tobacco Board, backed up by the Ministry of

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Commerce, actively promotes the cultivation of tobacco and provides technical and financial assistance to tobacco farmers. It also promotes the development of the tobacco industry and undertakes export promotion to sustain existing markets and explore new markets. As a result, India is the 4th largest producer of tobacco in the world. India ranks 14th in the world for manufacturing cigarettes, however when bidi is taken into account India rises to second place after China. Today 10% of the excise revenues and 2% of the Government of India's total revenues come from 660 million kgs of tobacco produced in the country. Whatever is the origin or source of drug, this deadly practice gravely affects the all phases of human cycle (WHO, 2000). There is, thus, inestimable loss to the social, economic and cultural life of the people and to wealth of the nation.

In India, consumption of tobacco has been growing at 2 to 3% per annum. Indians smoke approximately 90 billion cigarettes a year, with the average cost of Rs. 2 per cigarette they end up spending Rs. 180 billion a year. What do they get in response? 400,000 cases of cancer, 1.3 million cases of heart disease and also the undesirable honor of being world leader in cases of oral cancer. According to a recent report in Lancet, the latest figures of the Indian Council of Medical Research (ICMR) suggest that three tobacco related disease groups; cancers, coronary heart disease, and chronic obstructive lung disease had costed the country Rs. 277.61 billion (or \$6.5 billion) in 1999. Where as the nationwide sale value of all tobacco products was Rs. 244 billion. By any measure, this is bad economics (WHO, 2000).

This is not the end of the story, with its 250 million tobacco consumers, India is sitting on the verge of an unparalleled health crisis. According to FAO estimates, tobacco consumption in India will continue to increase at 2.4 percent per annum. Today tobacco kills 800,000 Indians a year, more than alcohol, cocaine, heroin, homicide, suicide, car accidents, fire and AIDS combined. Tobacco also kills four million people a year in the world. By 2030, it will kill 10 million people a year, more than the combined death toll from malaria and other major childhood killer disease. Over 70% of this tobacco induced deaths will happen in the developing world. So powerful is the addiction of nicotine and so blinding is the advertising appeal of tobacco products that most consumers, even highly educated ones, believe that somehow they will be spared.

People know pretty well that in most cases cancer cannot be cured. There is much more to the killer tobacco. Tobacco harms just about every part of the body it touches — on the way into, around and out of the smoker - from the skin and lips to the bladder. Here is the rest of the complaints and diseases.

- Increased coughing and sneezing
- Shortness of breath
- Chronic Bronchitis
- Emphysema
- TB
- Gangrene
- Peptic ulcer
- Weak eyesight
- Affected fertility

According to the Indian Council of Medical Research (ICMR) approximately 160,000 people develop cancer each year as a result of tobacco consumption. Every year some 4.5 million Indian smokers suffer from angina or heart disease and about 3.9 million people get lung disease. Oral cancer constitutes 12% of all cancers in men in which 8% of cancer is among 60+. Annual incidence rate is estimated 64,460. Researchers at the Tata Institute of Fundamental Research, Mumbai believe that the real number of cases at any given time might be 2.5 to 3 times higher than this number, because so far no proper epidemiological data is available in India.

#### ***What is the extent of tobacco use?***

There are more than 4,000 chemicals found in the smoke of tobacco products. Of these, nicotine, first identified in the early 1800s, is the primary reinforcing component of tobacco that acts on the brain. Cigarette smoking is the most popular method of using tobacco. The cigarette is a very efficient and highly engineered drug delivery system. By inhaling tobacco smoke, the average smoker takes in 1 to 2 mg of nicotine per cigarette. When tobacco is smoked, nicotine rapidly reaches peak levels in the blood stream and enters the brain. A typical smoker will take 10 puffs on a cigarette over a period of 5 minutes that the cigarette is lit. Thus, a person who smokes about 1-1/2 packs (30 cigarette) daily gets 300 'hits' of nicotine to the brain each day. Immediately after exposure to nicotine

there is a 'kick' caused in part by the drug's stimulation of the adrenal glands and resulting discharge of epinephrine (adrenaline). The rush of adrenaline stimulates the body and causes a sudden release of glucose, as well as an increase in blood pressure, respiration, heart rate (WHO, 1987).

Nicotine also suppresses insulin output from the pancreas, which means that smokers are always slightly hyperglycemic (i.e., they have elevated blood sugar levels). The calming effect of nicotine reported by many users is usually associated with a decline in withdrawal effects rather than direct effects of nicotine.

### ***Is nicotine addictive?***

Yes. Most smokers use tobacco regularly because they are addicted to nicotine. Addiction is characterized by compulsive drug seeking and use, even in the face of negative health consequences. It is well documented that most smokers identify tobacco use as harmful and express a desire to reduce or stop using it. Unfortunately, only about 6 percent of people are successful for more than a month.

Research has shown how nicotine acts on the brain to produce a number of effects. Of primary importance to its addictive nature are findings that nicotine activates reward pathways- the brain circuitry that regulates feelings of pleasure. A key brain chemical involved in mediating the desire to consume drugs is the neurotransmitter dopamine, and research has shown that nicotine increases levels of dopamine in the reward circuits. Nicotine's pharmacokinetic properties also enhance its abuse potential. Cigarette smoking produces a rapid distribution to the brain, with drug levels peaking within 10 seconds of inhalation. However, the acute effects of nicotine dissipate in a few minutes, as do the associate feeling of reward, which cause the smokers to continue dosing to maintain the drug's pleasurable effects and prevent withdrawal. (Research report, National Institute on Drug Abuse, 2000).

### ***Tobacco consumption among elderly***

In the view of public health importance of tobacco related health and social consequences, it is important to estimate the amount of tobacco consumed and gather information on the pattern of tobacco among elderly also. Substance abuse among the elderly is an "invisible epidemic" which may be due to negligence by relatives and care givers. Most of the researcher

highlighted that the symptoms of drug abuse are often mistaken for the symptoms of ageing problems such as dementia, depression or other problems commonly seen in older adults. Tobacco use appeared to negatively affect the health of the elderly at a higher rate than other population. Studies show that detrimental drug reactions occur 3-7 times more often for older adults, 12 % to 17% of acute hospital admissions for adverse drug reaction in this population (Crandall 1991, Stall 2001, Burns 1990). Adams and Eimm reported that 11% to 20% of acute care hospital admissions among the elderly were alcoholism and tobacco use related. Various studies suggested that alcohol and tobacco consumption are rarely recognized in this population. The studies also highlighted that prevalence of heavy drinking and regular smoking ranges from 20% to 40% for this population (Menniger, 2002, Ondus 1999, Rigler 200 and Eagger 2000). A study (Feldman and Tennstedt, 2004) shows that tobacco consumption is the major cause of respiratory problems among elderly. It revealed that an increased risk for impairment in mobility and high life stress among elderly male smokers and for low happiness and dissatisfaction with social relationships among elderly female smokers. The study also focused that smoking among the elderly persons may be associated with several negative qualities of life outcomes, but the direction of this relationship is not clear. Sally K. (2003) focused that in future as the older population grows, increasing number of older drug addicts will require health care. An epidemiological study conducted by Dentist (Ronald 2006) over the 1156 community dwelling adults aged 70 and older to determine whether lifetime use of tobacco products was a significant risk factor for tooth loss and periodontal disease. The study revealed that among England elders, tobacco use was more common among men (20%) than women (7.9%), with a combined rate of 12.3%. Further, 64.7% of men and 36% of women were previous tobacco users. Years of exposure to tobacco products were a statistically significant risk factor for tooth loss, coronal and root caries and periodontal disease. Such information is scarce from developing countries especially among elderly. Gerontologist and researcher largely ignore problem of drug abuse among elderly. Fewer studies have assessed the prevalence of tobacco among elder population in India. Gupta and Saxena (1989) found that tobacco consumption is 11.3% among the 55-64 year of age group and 16.8% among the 65-74 year age group in a rural population in north India. Varma et al (1990) found tobacco consumption 18.3% in the 50+ age group. Mohan et al (2001) found

that smoking takes a higher toll on the elderly. It causes cumulative damage that increases the risk of death and smoking related diseases with every birthday celebrated. Approximately 70% of the 4000000 individual who die each year from smoking related causes are over 60 year. According to one study (WHO & Ministry of Health and Family Welfare, 2004) tobacco consumption and hypertension are the major problems among elderly. The study found that tobacco consumption was 29% high among elderly than younger people. Bhatt & Mutharayappa (2006) conducted study in Karnataka, showed that habit of chewing tobacco and smoking was much higher among the elderly than the non-elderly people. It also highlighted that less educated and low standard of living. Similarly, higher percentage of elderly with middle level of education, which were working and belonged to low standard of living consumed alcohol. Interestingly, those who belong to high standard of living and with middle level of education smoked regularly.

The prevalence of tobacco consumption in other forms such as snuff, chewing tobacco, burnt tobacco powder, and paste was 19.3% and 9.9% in rural and urban elderly males respectively, 9.3 and 4.3% in rural and urban females respectively. As per WHO estimates, approximately 80% of elder smokers initiate their tobacco use before 25-30 years of age. Some previous research studies suggested that use of tobacco created behavioral problems, sleep disorder, antisocial behavior (Oetting and Beauvais, 1987; Rhodes and Jason, 1990), and low immune power (Ashby, 1995; Hahn, 1987; Tobias, 1986). One study showed that at the age of 50, smokers were more likely to have respiratory illness.

#### **Consequence of substance abuse among elderly:**

- About 2/3 of the elderly started smoking at a younger age.
- Tobacco smoking is the highest product which is abused by the elderly
- Person with early onset of substance abuse have a higher prevalence of antisocial behaviour.
- Stressful life events such as bereavement or retirement blues lead to tobacco consumption
- Gastrointestinal disease, asthma, T.B, disturbed sleep, restlessness, depression, dental problems and falls are the common health problems among the elderly tobacco consumers.

- Elderly who use tobacco is immunosuppressed and thus is at increased risk of infection and poor outcomes.
- In the future as older population grows, increasing number of elderly will require health care.
- Although alcohol and tobacco problems are under reported, tobacco use remains common problem among older persons.
- Users of smokeless tobacco have 50 times greater risk for mouth cancer than those who do not use such products.
- Those who are regularly around the smokers have a high risk of coronary artery disease, lung cancer and lower respiratory tract infections.

#### **Conclusion**

In India, substance abuse as a problem has many facets. On the one hand it is difficult to perceive "substance abuse in elderly" as a problem because of the cultural ethos and value system. Elderly are attached with certain standards and values that we cannot think of associating them with such an issue like substance abuse. On the other hand there are cities and villages where drug abuse is quite prevalent. Even there are places where consumption of liquor, hookah, chulam is supposed to be customary and ritualistic. However, in every circumstance, substance abuse in elderly needs to be more highlighted. This issue needs more research. More effective public health policies and programme should be developed in order to promote productive ageing. We need to add values and we need to add life to the years of the ageing population. *Let us pour life and not smoke to the lives of graying population. Lets make their lives smokeless with this promise the research moves on.....*

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# Urinary Incontinence in Elderly Physiotherapy Aspects: Literature Review

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## Abstract

Urinary incontinence in elderly is a significant health problem fraught with isolation, depression, increased risk of institutionalization and medical complications. It is very wrongfully accepted as normal part of aging process. This paper critically reexamines the literature to identify and apply relevant scientific principles and evidence to inform about effective treatment option. This paper emphasizes the fact that physiotherapy treatment has limited side effects and it does not jeopardize future treatment options. Various physiotherapy treatment approaches like behavioural training, physical therapy muscle training, electrical stimulation and biofeedback are discussed here individually.

Conclusion: Various physical therapy approaches should be used in conjunction for effective intervention in urinary incontinence.

**Key Words:** Urinary Incontinence, Biofeedback, Pelvic floor muscle training, Behavioral training

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## Introduction

The International Continence Society definition of urinary incontinence is "the involuntary loss of urine, which is objectively demonstrable, with such a degree of severity that it becomes a social or hygienic problem".<sup>1</sup> The reported prevalence of this condition is 15-30% in older community dwelling persons and is higher among women than men. In frail elderly it reaches up to 60-65%.<sup>2</sup>

Elderly with urinary incontinence normally don't seek help as they think it is a normal process of ageing or they feel too embarrassed to discuss this problem that results in depression, isolation from family with friends and poor quality of life. Furthermore incontinence is also one of the reasons why family members institutionalize their elderly relatives due to the fact that family members have a difficult time coping up with the situation.

A number of studies have determined the association of incontinence with depression. Women

with urinary incontinence are more likely to be addressed than their male counterparts.<sup>3</sup> As reported by Asia Pacific Advisory board, 54.4 % of elderly population don't seek help.

Stress incontinence is reported in 25 % of elderly. Urge incontinence is seen in 40-70% of cases of incontinence seen in elderly and functional incontinence is seen in 15 % elderly population.<sup>2</sup>

The number of old people is expected to increase in future and as the prevalence increases with age there will be more incontinent elderly individuals requiring treatment.

The literature reports that effective treatment approach may help in complete cure of incontinence. This review article assesses the efficacy of various physiotherapy treatment approaches with reference to urinary incontinence.

## Objective

To assess the efficacy of various physiotherapy treatment approaches for urinary incontinence in elderly.

## Search strategy

Relevant trials were identified from Cochrane database of systematic reviews (Jan. 2001-Jan 2009)

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and the reference lists of relevant articles from 1986-2009.

### **Selection criteria**

Randomized controlled trials and systematic reviews evaluating physiotherapy treatment approaches for urinary incontinence

### **Review of literature**

The various age associated changes in the urinary bladder include reduced bladder capacity, impaired contractibility, increased frequency of uninhibited contractions and abnormal relaxation pattern of detrusor, shorter time between awareness of need to void and symptomatic urgency, incomplete emptying and increased residual volume, reduced strength of pelvic floor muscles, reduced urethral closure pressure, sex specific changes including prostate enlargement in males, urethral shortening as well as sphincter weakness in females.<sup>2</sup>

Factors which precipitate acute urinary incontinence are Psychological problems like depression and psychosis, restricted mobility, clouded sensorium in delirium, symptomatic urinary tract infection, stool impaction, drugs through multiple mechanisms like sedation, anticholinergics, urethral relaxation and diuretics.<sup>2</sup>

Complications and consequences of urinary incontinence include, episodes of incontinence which are embarrassing leading to loss of self confidence and poor self esteem. 60% of incontinent elders develop depression. It leads to social withdrawal, isolation with limitation of physical activity leading to frailty and fear of involuntary urine loss during sexual activity may lead to disruption of intimate relationships. Productivity of elders as part of workforce is affected and caregivers are overburdened by added load of coping with the incontinent elder. Incontinence often leads to institutionalization of the elderly. It increases incidence of falls and consequent fractures in elderly women which may lead to increased morbidity, mortality with added financial burden.<sup>2</sup>

Physiotherapy assessment includes patient's description about the problem, history of present illness, bladder diary, medical and surgical history, pad test, pelvic floor assessment, manual grading of pelvic floor muscles, neurological examination (sensations and reflexes) should be carried out including assessment of functional and mobility status. General health status

(SF 36), impact of incontinence (Incontinence Impact Questionnaire), cognitive status (MMSE), psychological distress (Hopkin symptom checklist), symptom inventory (symptom index, international prostate symptom score), instrumental activities of daily living scale (IADL), Tinneti scale (gait), quality of life (social activity index) and uro-dynamic findings should be assessed.

### **Physiotherapy management of urinary incontinence**

There are four main domains of physiotherapy management consisting of pelvic floor exercises, electrical stimulation, biofeedback and behavioral training.

#### **Pelvic floor muscle exercises**

Pelvic floor exercises strengthen the musculature responsible for urethral resistance and reflex contraction of the pelvic floor and improve urinary control in stress. Contraction of pelvic floor muscle has reflex inhibitory effect on detrusor activity. Voluntary contraction of this muscle suppresses the inconvenient urge to void.<sup>4</sup>

The physiological basis behind these exercises was assessed in various studies and was concluded that exercising for fibre type would also be of value and may enhance normal reflex integration of muscle fibre activity.

Studies compared three months daily pelvic floor muscle exercise with a control groups receiving no treatment with 60% of patients in treatment group to be dry or mildly incontinent.

A Cochrane systematic review (2006) of pelvic floor muscle training for incontinence studied 13 trials involving 714 women, the authors concluded that PFMT should be included in first line conservative management programmes for women with stress, urge or mixed urinary incontinence.<sup>6</sup>

In a systematic review Berghmans et al showed that pelvic floor muscle exercises were effective in treatment of stress incontinence.<sup>7</sup>

#### **Electrical Stimulation**

Neuro-stimulation of pelvic floor aims at stimulating motor efferent fibres of the pudendal nerve causing contraction of pelvic floor muscle. Electrical stimulation restores continence by strengthening the structural support of urethra and bladder neck, securing resting and active closure of proximal urethra, strengthening of pelvic floor muscles.<sup>7</sup>

In stress incontinence electrical stimulation is focused on improvement of function of pelvic floor muscles while for patients with urge incontinence the aim seems to be to inhibit reflex bladder contractions.<sup>7</sup>

In a study by Sand et al trans-vaginal pelvic floor stimulation was found to be safe and effective therapy for genuine stress incontinence.<sup>8</sup>

Zollner et al examined the efficacy of maximal electrical stimulation in elderly patients with frequency, urgency, and urge incontinence. They reported improvement in subjective assessment and micturition charts. Maximal electrical stimulation was tolerated by elderly patients.<sup>11</sup>

In a study by Racovec et al, anal electrical stimulation is recommended as primary therapy in stress, mixed stress, motor and urge incontinence. The result showed increase in bladder volume measured at first sensation and at maximum cystometric capacity, reduction in maximum detrusor pressure contraction and significant increase in urethral closure pressure.<sup>12</sup>

### **Biofeedback**

Biofeedback treatment for incontinence aims to alter pathophysiologic responses of both smooth and striated muscles which mediate bladder control. It may be used to reinforce pelvic muscle recruitment to improve contractile force and muscle tone or to reinforce bladder inhibition.<sup>13</sup> A meta analysis of PFME with myofeedback showed a trend towards PFME with myofeedback as an effective treatment method for women with SUI, it's effective than pelvic floor exercises alone.

Burgio et al examined the effectiveness of teaching pelvic floor exercises with use of bladder sphincter biofeedback compared to training with verbal feedback in women with stress incontinence and found that biofeedback group improved the strength and selective control of pelvic floor muscles; the verbal feedback group did not.<sup>17</sup>

Burns et al in a randomized controlled trial assessed the efficacy of biofeedback for older women for treatment of sphincteric incompetence. He concluded that biofeedback and pelvic muscle exercises are efficacious in older women. Benefits are maintained and improvement continues for at least 6 months post-intervention. These therapies may be useful before considering invasive treatment.<sup>27</sup>

Berghmans et al in a systematic review suggested that biofeedback might be useful in those patients who are unable to perform a voluntary contraction of their pelvic floor muscles.<sup>7</sup>

Muller et al reported efficacy of pelvic floor exercises with biofeedback and maintenance of good results three months after treatment.<sup>15</sup> A study by Paula et al compared the effectiveness of pelvic floor muscle training with aid of a home biofeedback device to PFE alone for urinary incontinence and found that PFE aided with BFB is more successful than PFE alone.<sup>16</sup> It was observed that there was significant reduction in incontinence in 20 elderly men receiving biofeedback compared to a no treatment in control group of 28 men.<sup>13</sup>

In a study by Jeannette et al, they compared multimodal manometric BF, bladder training and pelvic muscle exercise to bladder training and pelvic exercise without biofeedback in 23 stress and urge incontinent women. The biofeedback group attained 75.9% reduction in incontinent episodes compared to 51% reduction in verbal feedback group. At 6 months both groups show non-significant relapse of symptoms.<sup>13</sup>

The effectiveness of an intensive group physical therapy programme was compared with individual biofeedback training in patients with stress incontinence and it was found that biofeedback therapy resulted in better subjective outcome and higher contraction pressure of pelvic floor muscles.<sup>17</sup>

### **Vaginal cones**

Plevnik introduced the concept of cone as a method of stimulating pelvic floor. He showed that women can be trained to contract PFM to retain cones of increasing weight in vagina. The feeling of loosing the cone from vagina initiates powerful sensory biofeedback response that causes PFM to contract around cone to retain it. He reported clinical success of 60-70% with use of cones.<sup>18</sup>

Other studies compared the efficacy of cone and IFT in stress incontinence and found no significant difference between the groups while Herbison et al reported that cones are better than no active treatment in stress incontinence.<sup>19</sup>

### **Behavioral Training**

Behavioral training includes bladder training, toileting assistance, lifestyle and dietary modifications. Three

types of toileting assistance programmes have been promoted: habit training, prompted voiding and timed voiding. Habit training was first described in relation to institutionalized geriatric patients. It involves identification of an incontinent person's toileting schedule which preempts involuntary bladder emptying by either decreasing or increasing the voiding intervals, while aiming to keep intervals as long as possible without incontinence.<sup>20</sup> Coping strategies are also reported to be useful which includes mainly stress and urge strategies. Distraction techniques such as deep breathing or mathematical problem solving were also shown to be successful.

Burgio et al studied behavioral training for post-prostatectomy urinary incontinence and reported that biofeedback plus behavioral training is an effective intervention for episodic stress or urge incontinence after prostatectomy.<sup>23</sup>

In a randomized controlled trial the efficacy of PFES and BFB assisted behavior training was compared for stress incontinence in elderly patients found that PFES did not enhance the outcomes of biofeedback assisted training.<sup>24</sup>

The potential benefits of timed voiding schedule in 131 community dwelling elderly patients of age group 55-90 yrs was studied for urinary incontinence. Incontinence episodes were reduced to 50 % in 75% of women.<sup>25</sup>

Goods et al examined the role of biofeedback in multi-component behavioral training programme for urge incontinence in community dwelling older women. The results showed that biofeedback to teach pelvic floor muscle control, verbal feedback based on vaginal palpation and a self help booklet all achieved comparable improvements in urge incontinence. Patient's perception of treatment were significantly better for two behavioral training interventions.<sup>28</sup>

## Discussion

This review of literature demonstrates that all the treatment options were effective for helping patients identify the pelvic floor muscles and use them to prevent episodes of urinary incontinence. Literature reports give conflicting opinions regarding their efficacy, though there seems to be unanimous agreement that these therapies improve the quality of life.

Bo et al compared the effect of PFE, electrical stimulation, vaginal cones and no treatment for genuine

stress incontinence and concluded that pelvic floor exercises are more effective than electrical stimulation, vaginal cones and no treatment for women with stress incontinence. As such exercise seems to be safe and effective it should be offered as first choice of treatment.<sup>26</sup> The finding that pelvic floor exercises are more effective than electrical stimulation was also confirmed in other studies where pelvic floor exercises were found to be more effective than electrical stimulation or oestrogen therapy in treatment of genuine stress incontinence.

Recommendations for the frequency of pelvic floor training vary from 10 contractions every waking hour to pelvic floor exercise for half an hour, three times per week. Bo et al recommended 8 to 12 contractions each of which consisted of 1 contraction held for as long as possible followed by 3 or 4 short once, three times per day plus group therapy once a week, encouraging maximum contractions.

The addition of pelvic floor electrical stimulation to exercises improved the outcomes measured with bladder diary and muscle strength. Hitoshi oh-oka reported that interferential therapy had safe and better effects than anti-cholinergics on elderly wet overactive bladder patients.<sup>9</sup>

The benefit of teaching Kegel exercise with a biofeedback protocol helps in simultaneously reinforcing contraction of pelvic floor muscles with inhibition of intraabdominal pressure.<sup>14</sup>

Caputo et al reported the efficacy of intravaginal electrical stimulation in treatment of SUI, DI and mixed urinary incontinence. During the intravaginal stimulation, activation of pudendal nerve motor efferents causes contraction of pelvic floor musculature which the patient perceives. This passive contraction helps to re-educate the patient to exercise correctly. Electrical stimulation induces bladder inhibition in patients with detrusor instability by regenerating the defective inhibitory pathways or reinforcing other inhibitory mechanisms. The optimal frequency of electrical stimulation for increasing urethral tone and bladder inhibition is reported to be 20-50 Hz and 5 -10 Hz respectively.<sup>4</sup>

A randomized controlled trial compared the effects of interferential current and biofeedback on incontinence severity in patients with urinary incontinence and reported both of them to be effective in improving pelvic floor muscle strength, incontinence intensity and quality of life of patients in the study.<sup>10</sup>

Biofeedback offers the patient the chance to manipulate electro-physical responses of his/her pelvic floor muscles according to visual and auditory signals. Most patients are not aware of how their pelvic floor muscles work. Biofeedback is used especially for identification of the pelvic floor muscles and to check if the exercises are performed correctly or not, thereby, it helps in gaining the confidence and motivation of the patient.

Although literature analysis revealed that IFC and biofeedback seemed to cause similar amount of improvement. IFC may be preferred when biofeedback application is not appropriate as in some geriatric patients (in whom co-operation is reduced due to visual or auditory incapacity).

The value of biofeedback in Kegel's exercises and the sensory feedback experienced can trigger new motor learning and increase compliance with pelvic floor exercise.

The efficacy of vaginal cones in postmenopausal females was studied and was found to be highly significant when correlated between decreased urine loss and increase in retained cone weight.<sup>18</sup> Cone therapy offers an easy method of distinguishing the use of pelvic floor muscles from abdominal wall contraction, as raised intra-abdominal pressure will enhance the downward force of the cone on pelvic floor, increasing the exercise effect.

Bo et al questioned use of cone from exercise science perspective. Cone in 15-20 minutes might cause reduced blood supply, reduced oxygen consumption, muscle fatigue leading to overuse injury.<sup>26</sup>

Incorporation of behavioral treatment in urinary incontinence in 39 elderly patients (19 had stress, 12 with detrusor instability and 8 without instability) and reported reduced frequency of incontinent episodes on average of 82%, 85% in patients with detrusor instability and 13 patients achieved total continence.<sup>21</sup>

The efficacy of behavioral therapy alone or in association with bladder sphincter biofeedback showed reduction in wetting episodes by 82% for the behavioral therapy group and 79% for the group that included biofeedback and persisted at 6 month follow up. Thus behavioral modification is very successful in controlling incontinence in elderly ambulatory patients.

In Cochrane database review, three trials of 172 women compared bladder training with no bladder

training and no statistical difference as found between the groups.<sup>22</sup>

## Results

Literature reviews of each aspect of treatment approach points towards the need for more studies comparing the effects of treatment approaches in various types of urinary incontinence and standardization of outcome measures and protocols for the management.

## Conclusion

Various treatment approaches work better when used in conjunction with each other. A multifaceted approach should be used for treatment of elderly patients with urinary incontinence. Physiotherapy treatment modalities for urinary incontinence are safe with no documented side effects and it does not jeopardize future treatment options

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# Clinical Profile of Geriatric Pensioners of Urban Dibrugarh

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## Abstract

Keeping in view of the frequent geriatric ailments, an observational study was undertaken amongst geriatric pensioners of urban Dibrugarh to assess their clinical profile. **Inclusion criteria-** Geriatric pensioners of 60 years and above. **Results-** The study subjects showed a mean age of 69.04 years  $\pm$  6.63, mean height of 158.60 cm  $\pm$  9.79, mean weight 60.98 kg  $\pm$  11.38, mean body fat percentage 25.36%  $\pm$  7.91, and mean triceps skin fold thickness 12.70 mm  $\pm$  4.8. The mean systolic BP of the study population was 130.80 mm  $\pm$  11.79, mean diastolic BP was 79.85 mm  $\pm$  6.50, mean pulse rate was 71.69  $\pm$  5.82, mean blood sugar was 138.42 mg/dl  $\pm$  50.25 with a range between 63-342 mg/dl and mean body mass index was 24.20  $\pm$  3.74 with a range from 15.73- 32.46 respectively. **Summary-** Ten percent prevalence of diabetes was found in the study subjects, out of that 2.5 percent (2 cases) were first time diagnosed as diabetic. Prevalence of hypertension was 36.25% and that of pre-hypertension found in 45% of the study subjects.

**Key word:** clinical profile, pensioners

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Ageing is a natural progressive but decline in body systems which starts in early adulthood and becomes obvious several decades later. Another way to define old age precisely is to say that it begins at conventional retirement age (i.e. above 60 years). The organ systems of individuals age at different rates and many old people live well into their 80's and beyond. So, commonly accepted terms are: young olds (65-74 years), old olds (75-84 years) and oldest olds (85+).

The age at which one's productive contribution declines and one tends to be economically dependent can probably be treated as the onset of the aged stage of life. Considering the socioeconomic situation of India, age 60 seems an appropriate cut off, as against age 65 in many other countries.

## Global trend

In 1980, world elderly population was 381.8 million which was 8.6% of the total world population. The present geriatric population is 650 million and comprises 10% of total population of the world. The projected world elderly population in 2025 shall be 1021 million and would comprise 14.8% of total world population (World Population Prospect, 1988, U.N. New York).

In 1980, 43.2 million (6.5% of total) elderly population was in India. In 2000, it increased to 75.7 million (7.4% of total Indian population).

Estimates from the Centre for Disease Control and Prevention indicate that, in 1998, 12.7% of persons aged 70 and older had a diagnosis of DM, up from 11.6% in 1990.<sup>1</sup> There are also large numbers of older adults, almost 11% of the U.S. population aged 60 to 74, with undiagnosed DM.<sup>2</sup>

Researchers at the University of Michigan Health System analyzed the responses of more than 11,000 participants in the National Health and Retirement Study. They found that 50 percent of older adults had a moderate to severe form of at least one of the following

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conditions: cognitive impairment, falls, incontinence, low body mass index, dizziness, vision impairment or hearing impairment.<sup>3</sup> Most older adults with common geriatric health conditions live in the community rather than in nursing homes and are not under the care of a geriatrician."An approach to their care that included the identification and management of geriatric conditions is needed,"<sup>4</sup>

Studies estimated 20-25% of Hispanic elders have hypertension. Some studies report higher prevalence of hypertension in elderly Hispanic women whereas others conclude that hypertension rates are not significantly increased. Elderly Hispanic men do not appear to have significantly increased hypertension rates compared to other groups. Only an estimated 35% of elderly Hispanic hypertensives are receiving treatment and fewer than 15% are controlled.

Studies report up to 26% of elderly Hispanics have type 2 diabetes and rates are increasing "at an alarming rate" Age, obesity, and family history are associated with increased risk of diabetes but gender, physical activity, educational attainment, and degree of acculturation do not appear to influence risk. Low rate of diagnosis, problems with glycemic control, and the adverse effects of co-morbid medical problems contribute to elderly Hispanics having higher rates of retinopathy, amputation, and end-stage renal diseases than comparable non hispanic woman.<sup>5</sup>

There are different health problems encountered in the elderly. Some of these are senile dementia, cataract, hearing impairment, speech disability, osteoarthritis, hypertension, atherosclerosis and its

complications, COPD, diabetes mellitus, cancers, ischaemic heart disease, prostatic enlargement, urinary tract infections, depressions etc. Keeping in view of the frequent geriatric ailments this is a descriptive study undertaken amongst the Geriatric Pensioners of Dibrugarh urban to assess their clinical profile.

**Aims**

To study the clinical profile of geriatric pensioners of Dibrugarh.

*Inclusion criteria*

Geriatric pensioners of Dibrugarh and age 60 years and above.

*Exclusion criteria*

Age below 60 years and non pensioners above 60 years

**Results**

The study subjects showed a mean age of 69.04 years ± 6.63, mean height of 158.60 cm ± 9.79, mean weight 60.98 kg ± 11.38, mean body fat percentage 25.36% ± 7.91, and mean triceps skin fold thickness 12.7 mm ± 4.88 (Table 1).

**Summary**

The study subjects showed a mean age of 69.04 years ± 6.63, mean height of 158.60 cm ± 9.79D, mean weight 60.98 kg ± 11.38SD , mean body fat percentage 25.36% ± 7.91, and mean triceps skin fold thickness 12.70 mm ± 4.88.

The mean systolic BP of the study population was

**Table 1.** Descriptive Statistics (Number of Subjects = 80)

<b>Variables</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
Age (years)	60	85	69.04	6.63
Height (cm)	141	179	158.60	9.79
Weight (kg)	34	82	60.98	11.38
Body fat percentage	10.0	44.20	25.36	7.91
TSFT (mm)	6	26.00	12.70	4.88
Systolic BP (mm Hg)	108	160	130.80	11.79
Diastolic BP (mm Hg)	64	98	79.85	6.50
Pulse rate/minute	60	90	71.69	5.82
Random blood sugar (mg/dl)	63	342	138.42	50.25
Body mass index	15.73	32.46	24.20	3.74

130.80 mm  $\pm$  SD 11.79, mean diastolic BP was 79.85 mm  $\pm$  SD 6.50, mean pulse rate was 71.69  $\pm$  SD 5.82, mean blood sugar was 138.42 mg/dl  $\pm$  SD 50.25 with a range between 63-342 mg/dl and mean body mass

**Table 2.** Status of hypertension

Status	No. of Subjects	Percentage
Normotensive	15	18.75
Pre-hypertensive	36	45.00
Hypertensive	29	36.25
Total	80	100.00

The results showed 10 percent prevalence of diabetes in the study subjects. 2.5 percent (2 cases) were first time diagnosed as diabetic (Table 3).

**Table 3.** Prevalence of Diabetes

RBS	No. of Subjects	Percentage
< 200 mg/dl	72	90.0
$\geq$ 200 mg/dl	8	10.0
Total	80	100.0

index was 24.20  $\pm$  SD3.74 with a range from 15.73-32.46 respectively.

Ten percent prevalence of diabetes was found in the study subjects, out of that 2.5 percent (2 cases) were first time diagnosed as diabetic. Prevalence of hypertension was 36.25% and that of pre-hypertension found in 45% of the study subjects. A comparative study with comparable non pensioners is suggested to evaluate the difference in prevalence of various ailments and nutritional parameters.

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