PalArch's Journal of Archaeology of Egypt / Egyptology

A STUDY ON QUALITY OF LIFE IN OLD AGE COMMUNITY DWELLING ADULTS

SATHISH PUSHPARAJ [1*] JANANI SELVAM [2] AND VASANTHY MUTHUNARAYANAN [3]

[1 *]Post Doctoral Fellowship in Architecture, Lincoln University College, Malaysia.

[2] Lincoln University College, Malaysia.

[3]Department of Environmental Biotechnology School of Environmental Sciences, Bharathidasan University, Tiruchirapalli – 620 024, Tamil Nadu, India.

SATHISH PUSHPARAJ [1*] JANANI SELVAM [2] AND VASANTHY MUTHUNARAYANAN [3] , A STUDY ON QUALITY OF LIFE IN OLD AGE COMMUNITY DWELLING ADULTS – Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(12). ISSN 1567-214x

Key words: Physical activity, Quality Life, Adults, Thanjavur

ABSTRACT

The older dwelling adults group analysis, 44.4 per cent with diabetes reported average physical activity, 40.7 per cent reported low physical activity and 11.1 per cent subject showed very low physical activity. 52.3 per cent with hyper-tension showed average physical activity, 40.2 per cent low physical activity and others showed very low physical activity. Along with high cholesterol (HC), only 20.8 per cent showed average physical activity, 70.8 per cent low and 8.3 per cent very low physical activity. In obese group, average physical activity was shown by 42.9 per cent sample, 45.7 per cent and 11.4 per cent subjects showed low and very low physical activity, respectively. 52 per cent normal subjects reported average physical activity, 39.3 per cent and 8.4 per cent subjects showed low and very low physical activity, respectively.

INTRODUCTION

The foundation for adult body weight is laid already during adolescence and implications of this would be to emphasize physical activity at a young age. Physical activity plays an important role in weight maintenance. WHO (2006) opines that participation in appropriate

amount of physical activity can support healthy weight. The more vigorous the activity, and more the frequency, greater will be the regular physical activity which will maintain ideal body weight.

World Health Organization in 1950, several anthropologists Received appointments to international health posts (Darshna, 2006). Thus anthropometric and epidemiological Issues are needed to be studied for useful generalization of the selected population. Extensive literatures have been studied for better understanding of the present studies. Mohan et al., (2007) studied India, one of the largest countries of the world to incur the number of diabetic patients. The estimation of diabetic patients in India according to the Diabetes Atlas 2006 published by the International Diabetes Federation, it is expected the number of people with diabetes in India currently around 40.9 million which will rise to 69.9 million by 2025 unless urgent precautionary steps are adopted(Sandeep et al.,). The main causes refer to certain unique clinical and biochemical abnormalities with increase insulin resistance and greater abdominal adiposity i.e., higher waist circumference in spite of lower body mass index, lower adiponectin and higher high sensitive C-reactive protein levels. At least a part of this is due to genetic factors. The primary driver of the epidemic of diabetes is the rapid epidemiological transition associated with changes in dietary patterns and decreased physical activity as evident from the higher prevalence of diabetes in the urban population (Mohan et al., 2007). Similarly, cardio-vascular problem is also closely related with the dietary habit and life style of people. Since the last two decades, the scientific technique of anthropology has emerged as an essential method in biomedical research. Anthropometric studies have show that the pattern of body fat distribution is an important risk factor for coronary heart disease (CHD, noninsulin depent diabetes due to the high prevalence of type -2 diabetes and its squeal, (Ramachandran et.at., 2002). Thus, a number of cross-section studies have explained the decrease in average height with age during third stage of human life span (khosa et,al., 1968; Tanner et.al., 1951). The decline of height produces weakening of muscles, postural changes, osteoporosis, spinal deformities, disk deterioration suck as scoliosis and hypnosis (Tanner et.al., 1951). Based on the work of das (1978), it may be said that assumes Muslim who started settling in Assam since thirteenth century and have adapted assumes language and culture exhibit a affinity with the local Hindu caste in respect of stature and head form. The distributation of subcutaneous fat is an important aspect as it is not uniform in human body. The measure of subcutaneous fat at the extremities and trunk respond differently in response to variation in nutrition status or energy balance (Bogin, 1981). Work has been done on patterns of fat distribution as affected by age sex(Edwards, 1951; Katch et al., 1980; Goran et.al., 1995; Gillum, 1987;

Johnston et.al., 1991; Jones et.al., 1994; Mueller et al., 1994; Reynold, 1951; Skerlz et al., 1951; Damom et al., 1972; broken and Norris, 1977), socio economic status (Georges et.al., 1993; Indech et.al.,1991, with increasing adiposity (Edward, 1950; garn, 1955a,b; Satwanty et.al., 1990), on effect of levels of exercise and increased physical activity on fat distribution pattern(brown et al., 1977; Bhalla et al., 1983). Study of the U.S. department of health and human services,(2008), report that cardiac events, such as a heart attack or sudden death during physical activity, are rare. However, the risk of such cardiac events does rise when a person suddenly becomes much more active than usual. It is found to occur at higher risk among the adults who are inactive whereas it is being at lower risk among the active groups. In the study of Das (2010) the biepicondylar breadth of humerus had 4% loss in active and 2.19% gain in sedentary women after marriage. The study thus revealed important facts about the relationship between physical activity pattern and weight status of the respondents was examined in the present study.

RESEARCH METHODOLOGY

A total sample of 520 (male and female) from different peoples was selected following purposive sampling method for the present study age range of the subjects was between 30 to 65. The present study is an Ex-post-facto type of research. The Expost-facto research is systematic empirical inquiry in which the researcher does not have direct control of independent variable because their manifestations have already occurred or because they are inherently manipulated. Inference about relation among variables is made without direct intervention, from concomitants variation of independent and dependent variables (Kerlinger, 1983).

INDEPENDENT VARIABLES

Physical activity level, physical activity awareness, barrier to physical activity, BMI and WHR.

TOOLS

Each questions of the questionnaire except physical activity level (PAL) had a code with yes or no, in response yes 1 mark was awarded and mark was not awarded for response No. Physical activity level questions had three options and 1, 2 and 3 marks were given to each option respectively. The sum of values scored by each subject was determined to a certain health problems awareness, physical activity level and barrier to physical activity. Obtained scores were converted into norms on the basis of normal curve distribution. The scores were classified into five categories that were very low, low, average, high and very high for hypo-kinetic problems awareness, physical activity level

(PAL) barrier to physical activity (BPA), environmental barrier (EB) and personal barrier (PB).

Table 1: The International classification of adult underweight, overweight and obesity according to body mass index (BMI)

Classification	BMI (kg m^{-2})	
	Principal cut-off points	Additional cut-off points
Underweight	**<18.50**	**<18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	**18.50 - 24.99**	**18.50 - 22.99**
		23.00 - 24.99
Overweight	**•25.00**	**•25.00**
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	**•30.00**	**•30.00**
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	•40.00	•40.00

(Source: Adapted from WHO, 1995, WHO, 2000 and WHO, 2004)

RESULTS AND DISCUSSION

The frequency and percentage of prevalence of health problems, physical activity level, awareness regarding Health problems, physical activity and barrier to physical activity.

Table 2: Physical activity (hrs day^{-1}) among Public

Activity Level			
No Activity	**Mild**	**Moderate**	**Heavy**
19.04%	76.35%	3.65%	0.96%
(99)	(397)	(19)	(05)

Table 2 and Fig 1 shows that 76.35 per cent (397) subjects were involved in mild physical activity, 3.65 per cent (19) subjects in moderate physical activity **(**PA), only 0.96 per cent (5) subjects were involved in vigorous physical activity. 19.04 per cent subjects were not involved in physical activity.

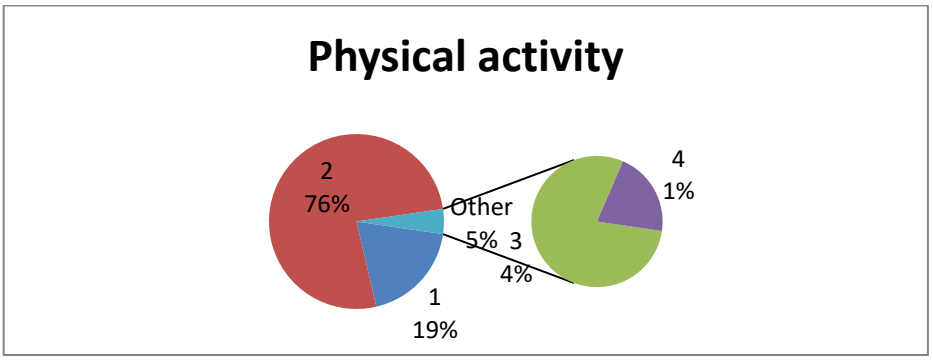


Fig .1: Physical activity (hrs day^{-1}) among Public

Table 3: Prevalence of health problems among total sample of Publics, Age wise

Disease	Age category (60 above)	Age category (51-60)	Age category (41-50)	Age category (30-40)
Total count	**25**	**91**	**337**	**67**
% of total count	4.8%	17.5%	64.8%	12.9%
Diabetes	**01**	**15**	**28**	**10**
Count	4.0%	16.5%	8.3%	14.9%
High Blood Pressure	**06**	**21**	**92**	**13**
Count	24.0%	23.1%	27.3%	19.4%
H. Cholesterol	**02**	**05**	**17**	**00**
Count	8.0%	5.5%	5.0%	0%
Obese	**00**	**07**	**22**	**06**
Count	0.0%	7.7%	6.5%	9.0%
Normal	**16**	**43**	**178**	**38**
Count	64.0%	47.3%	52.8%	56.7%

In the present study, the subjects were divided into four age

categories as shown in the Table 3. Fig 2 to 6. Prevalence of health problems is higher in the age group 41-50 years followed by 51-60 years and 30-40 years, respectively. It is observed that 19.4 to 27.3 per cent subjects in various age groups suffered from high blood pressure, which means more subjects, suffer from high blood pressure followed by diabetes which is prevalent among 4-16.5 per cent of population under study.

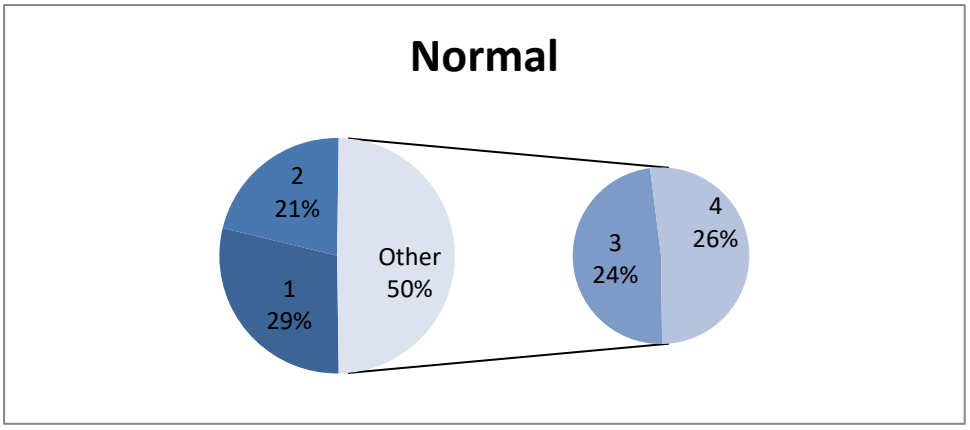


Fig 2: Health problems among Publics of all age categories

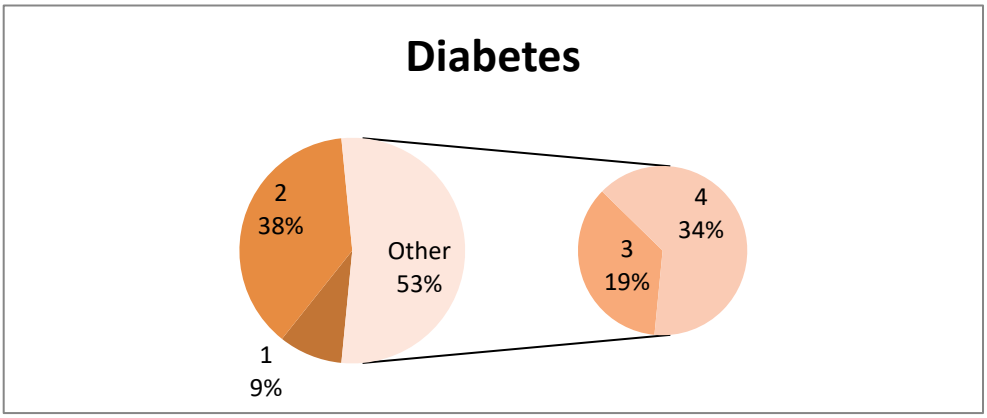


Fig 3: Diabetes problems among Publics of all age category

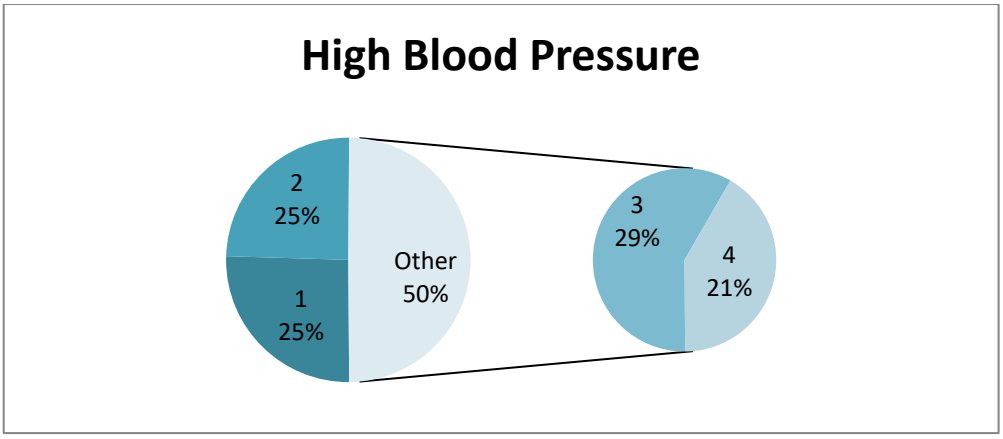


Fig 4: High blood pressure problems among Publics of all age category

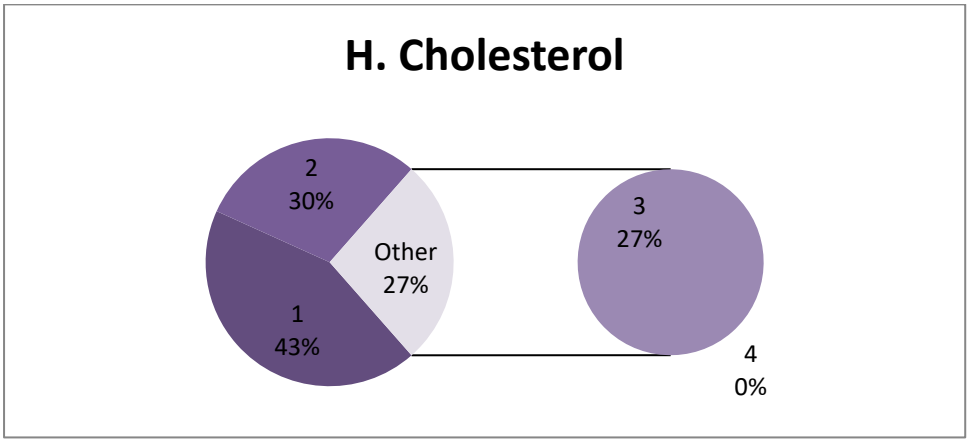


Fig 5: H.Cholesterol problems among Publics of all age category

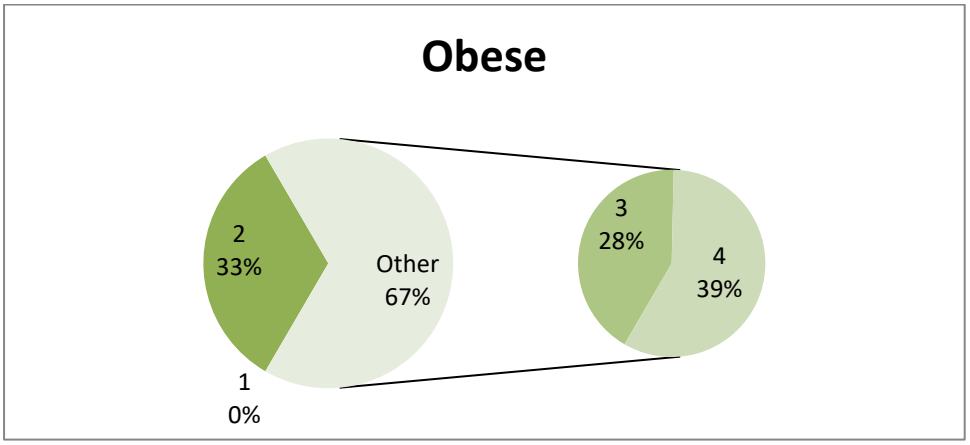


Fig 6: Obese problems among Publics of all age category

Table 4: Chi-square test (Age category)

	Value	Df	Asymp. Sig (2-sided)
Pearson chi-square	16.247[a]	12	.180
Likelihood ratio	20.651	12	.056
Linear-by-linear association	.110	1	.741
N of valid cases	520		
a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is 1.15.			

Table 4. shows that chi-square value is 16.247[a] which is non-significant. It indicated that there is no significant association between health problem and age.

Table 5: Prevalence of Health problems within groups

Disease	Count	Age Category (60 above)	Age Category (51-60)	Age Category (41-50)	Age Category (30-40)
Diabetes	**54**	1.9%	27.8%	51.9%	18.5%
HBP	**132**	4.5%	15.9%	69.7%	9.8%
H. Cholesterol	**24**	8.3%	20.8%	70.8%	0.0%
Obese	**35**	0.0%	20.0%	62.9%	17.1%
Normal	**275**	5.8%	15.6%	64.7%	13.8%

Table 5 shows that within the health problem group, 51.9 per cent subjects of 41-50 age category suffered from diabetes followed by 27 per cent in 51- 60 age category and 18.5 per cent in 30-40 age category. Similarly 69.7, 70.8 and 62.9 per cent subjects in 41-50 years age

category reported HBP, HC and obesity, respectively. Prevalence of the entire health problem among age category 51-60 was lower as compared to age group 41-50.

Table 6: Prevalence of health problems among total sample of Publics, Gender wise

Health disease	Gender statues		Total
	Male	Female	
Total	**254**	**266**	**520**
% Within health problems	48.8%	51.2%	100.0%
Diabetes	**35**	**19**	**54**
% Within gender statues	13.8%	7.1%	10.4%
HBP	**54**	**78**	**132**
% Within gender statues	21.3%	29.3%	25.4%
H. Cholesterol	**11**	**13**	**24**
% Within gender statues	4.3%	4.9%	4.6%
Obese	**16**	**19**	**35**
% Within gender statues	6.3%	7.1%	6.7%
Normal	**138**	**137**	**275**
% Within gender statues	54.3%	51.5%	52.9%

Table 6 depicts the picture of prevalence of health problems in relation to gender in total sample. There is difference in prevalence of various health problems between male and female subjects, more female subjects (29.3%) reported HBP as compared male (21%). All other HKP showed less prevalence in female as compared to male.

Table 7: Chi-square test (Gender)

	Value	Df	Asymp. Sig (2-sided)
Pearson chi-square	9.260[a]	4	.055
Likelihood ratio	9.352	4	.053
Linear-by-linear association	.001	1	.977
N of valid cases	520		
0 cells (.0%) have expected count less than 5. The minimum expected count is 11.72.			

Chi-square value is 9.260 which is significant at .055 levels. It indicated that there is significant association between health problems and gender (Table 7).

Table 8: Gender wise percentage of public within health problems groups

Disease	Count	Male	Female
Diabetes	**54**	64.8%	35.2%
HBP	**132**	64.8%	35.2%
H. Cholesterol	**24**	45.8%	54.2%
Obese	**35**	45.7%	54.3%
Normal	**275**	50.2%	49.8%

Table 8 shows that within the disease group, prevalence of diabetes and high blood pressure was higher in male as compared to female, whereas high cholesterol and obesity were higher in female as compared to male.

Table 9: Prevalence of health problems among total sample of publics as per marital status

	Marital statues		Total
	Married	Un-married	
Total	**494**	**26**	**520**
% Within health problems	95.0%	5.0%	100.0%

Diabetes	**53**	**01**	**54**
% Within marital statues	10.7%	3.8%	10.4%
HBP	**126**	**06**	**132**
% Within marital statues	25.5%	23.1%	25.4%
H. Cholesterol	**22**	**02**	**24**
% Within marital statues	4.5%	7.7%	4.6%
Obese	**33**	**02**	**35**
% Within marital statues	6.7%	7.7%	6.7%
Normal	**260**	**15**	**275**
% Within marital statues	52.5%	57.7%	52.9%

Table 9 that as per marital status of the subjects, it was observed that 5.0 per cent un-married subject and 95.0 per cent of married subjects out of total sample reported prevalence of various health problems under study.

Table 10: Chi-square test (Marital status)

	Value	**Df**	**Asymp. Sig (2-sided)**
Pearson chi-square	1.903[a]	4	.754
Likelihood ratio	2.152	4	.708
Linear-by-linear association	.763	1	.382
N of valid cases	520		
0 cells (.0%) have expected count less than 5. The minimum expected count is 11.72.			

Chi-square value is 1.903 which is non-significant at .754 levels. It indicated that there was no-significant association between health problem and marital status (Table 10).

Table 11: Body mass index categories among total samples of publics

Health disease	Body mass index category				Total
	Under Weight	Normal Weight	Pre-Obese	Obese	
Total	**07**	**168**	**275**	**70**	**520**
% Within total sample	1.35%	32.3%	52.9%	13.5%	100.0%
Diabetes	**04**	**27**	**15**	**08**	**54**
% Within BMI category	57.14%	16.07%	5.45%	11.4%	10.4%
HBP	**01**	**17**	**97**	**17**	**132**
% Within BMI category	14.29%	10.12%	35.27%	24.3%	25.4%
H. Cholesterol	**00**	**03**	**16**	**05**	**24**
% Within BMI category	0.0%	1.79%	5.81%	7.1%	4.6%
Obese	**02**	**09**	**15**	**09**	**35**
% Within BMI category	28.57%	5.36%	5.45%	12.85%	6.73%
Normal	**00**	**112**	**132**	**31**	**275**
% Within BMI category	00%	66.66%	48%	44.28%	52.9%

Body mass index categories considered were under weight, normal, over weight and obese. The result reveals that 52 per cent of participants were belonged to pre-obese category and 13.5 per cent participants were obese (Table 11).

Table 12: Physical activity among total samples of Publics

Health problems		Physical activity level				Total
	Very high	High	Average	Low	Very low	
Total	**01**	**04**	**256**	**216**	**43**	**520**
% Within physical activity	.2%	.8%	49.2%	41.5%	8.3%	100.0%
Diabetes	**00**	**02**	**24**	**22**	**06**	**54**
% Within physical activity	.0%	50.0%	9.4%	10.2%	14.0%	10.4%

HBP	**01**	**01**	**69**	**53**	**08**	**132**
% Within physical activity	100.0%	25.0%	27.0%	24.5%	18.6%	25.4%
Cholesterol	**00**	**00**	**05**	**17**	**02**	**24**
% Within physical activity	.0%	.0%	2.0%	7.9%	4.7%	4.6%
Obese	**00**	**00**	**15**	**16**	**04**	**35**
% Within physical activity	.0%	.0%	5.9%	7.4%	9.3%	6.7%
Normal	**00**	**01**	**143**	**108**	**23**	**275**
% Within physical activity	.0%	.4%	52.0%	39.3%	8.4%	100.0%
% of Total	.0%	.2%	27.5%	20.8%	4.4%	52.9%

Table 12 shows results in terms of frequency and percentage of the selected in different categories of physical activity which was classified in four categories as high physical activity, average physical activity, low physical activity and very low physical activity. In total subjects, 49.2 per cent (256) showed average physical activity and 41.5 per cent (216) subject exhibited low physical activity. Among subjects with average physical activity 52 per cent subjects were from normal group and among low physical activity, 39 per cent subjects were from normal group.

Table 13: Chi-square test (Physical activity)

	Value	**Df**	**Asymp. Sig (2-sided)**
Pearson chi-square	86.069[a]	16	.000
Likelihood ratio	68.597	16	.000
Linear-by-linear association	2.342	1	.126
N of valid cases	520		
a. ***13 cells (52.0%) have expected count less than 5. The minimum expected count is .09.***			

Chi-square value is 86.069[a] which is significant at .000 levels. It indicated that there is significant association between disease and physical activity (Table 13).

Table 14: Physical activity level with in groups

Disease	Count	Very high	High	Average	Low	Very low
Diabetes	**54**	.0%	3.7%	44.4%	40.7%	11.1%
HBP	**132**	.8%	.8%	52.3%	40.2%	6.1%
Cholesterol	**24**	.0%	.0%	20.8%	70.8%	8.3%
Obese	**35**	.0%	.0%	42.9%	45.7%	11.4%
Normal	**275**	.0%	.4%	52.0%	39.3%	8.4%

Table 14 shows that within the group analysis, 44.4 per cent teachers with diabetes reported average physical activity, 40.7 per cent reported low physical activity and 11.1 per cent subject showed very low physical activity. 52.3 per cent teachers with hyper-tension showed average physical activity, 40.2 per cent low physical activity and others showed very low physical activity. Among teachers with high cholesterol (HC), only 20.8 per cent showed average physical activity, 70.8 per cent low and 8.3 per cent very low physical activity. In obese group, average physical activity was shown by 42.9 per cent sample, 45.7 per cent and 11.4 per cent subjects showed low and very low physical activity, respectively. 52 per cent normal subjects reported average physical activity, 39.3 per cent and 8.4 per cent subjects showed low and very low physical activity, respectively.

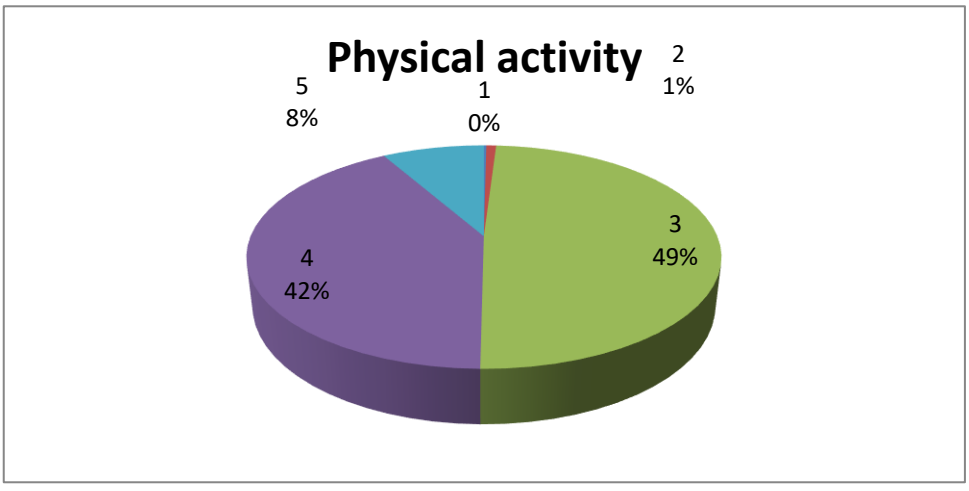


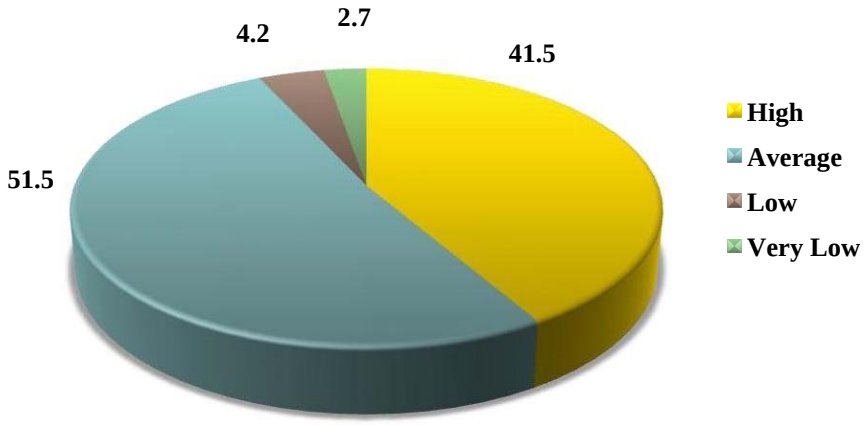
Fig 5: Diagrammatic presentation of Physical activity

Table 15: Personal barrier to participate in physical activity among total samples

Disease	High barrier	Average barrier	Low barrier	Very low Barrier
Total count	**216**	**268**	**22**	**14**
% of total count	41.5%	51.5%	4.2%	2.7%
Diabetes	**6%**	**13.4%**	**4.5%**	**28.6%**
Count	13	36	01	04
High blood pressure	**28.2%**	**23.9%**	**31.8%**	**00**
Count	61	64	07	00
H. Cholesterol	**3.2%**	**4.1%**	**18.2%**	**14.3%**
Count	07	11	04	02
Obese	**8.8%**	**4.9%**	**4.5%**	**14.3%**
Count	19	13	01	02
Normal	**53.7%**	**53.7%**	**40.9%**	**42.9%**
Count	116	144	09	06

Personal barrier scores were classified into four categories *i.e.*, high barrier, average barrier, low barrier and very low barrier. The results exhibit that 41.5 and 51.5 per cent (of total sample) public felt high and moderate barrier for participation in physical activity, respectively, which is of great concern (Table 15 and Fig 6).

Fig 6: Personal barrier among Public



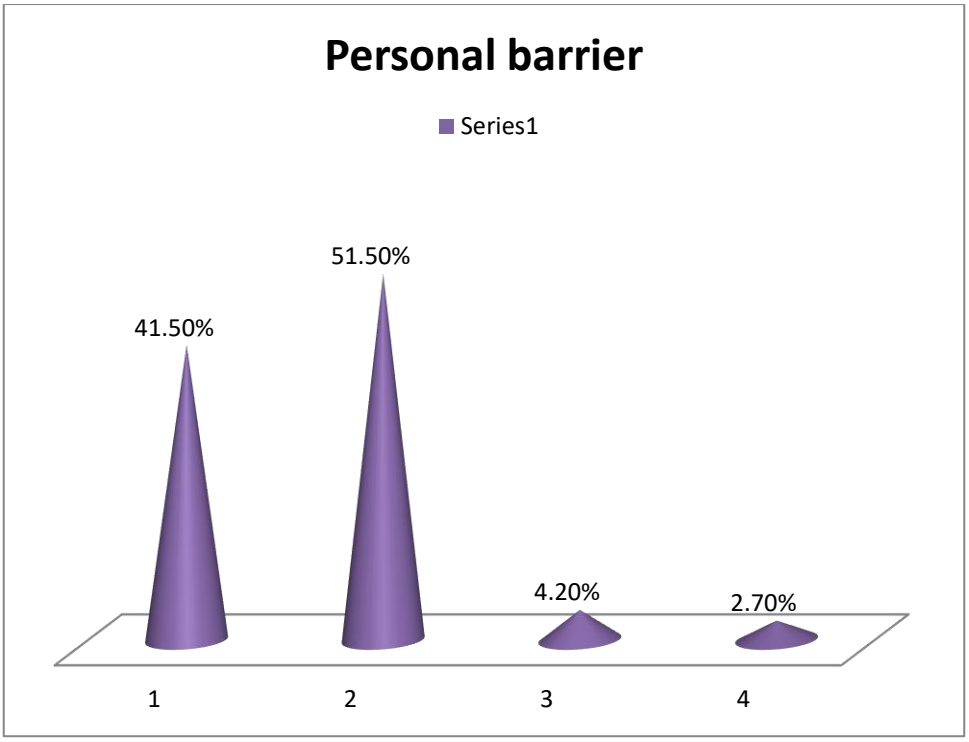


Table 16: Chi-square test (Personal barrier)

	Value	df	Asymp. Sig (2-sided)
Pearson chi-square	34.082[a]	12	.001
Likelihood ratio	31.977	12	.001
Linear-by-linear association	1.744	1	.187
N of valid cases	520		

a. 7 cells (35.0%) have expected count less than 5. The minimum expected count is.65.

Chi-square value is 34.082[a] which is significant at .001 levels. It indicated that there is significant association between disease and personal barriers of physical activity (Table 16).

Table 17: Personal barriers to participate in physical activity within groups

Disease	Count	High barrier	Average barrier	Low barrier	Very low Barrier
Diabetes	54	24.1%	66.7%	1.9%	7.4%
High Blood Pressure	132	46.2%	48.5%	5.3%	0%
H. Cholesterol	24	29.2%	45.8%	16.7%	8.3%
Obese	35	54.3%	37.1%	2.9%	5.7%
Normal	275	42.2%	52.4%	3.3%	2.2%

Table 17 reveals the personal barrier to physical activity among teachers suffering from various health problem and normal group. It was noted that large percentage of public having different health problems under study reported high (24.1-53.3%) to average (37.1-66.7%) barrier to participate in physical activity, whereas 42.2 and 52.4 per cent normal subjects reported high and average barrier, respectively.

The prevalence of health problems continues to increase in adults and older adults. Diet and life style seems to be factors responsible for the same. Diet can be elaborated as excess fat and junk food and improper time of food intake. Sedentary lifestyles is defined in relation to the numbers of hours that individual spend sitting down in a typical day or the number of hours expended walking or in either specific activities (Jose *et al*., 2003). Health should be the ultimate responsibility of an individual but it has been observed that it is ignored most. There is increasing evidence that physical activity is associated with altered risk for health problems. Participation in regular physical activity leads to longevity, increased quality of life and various psychological and emotional benefits. It is necessary to work for health promotion continuously to address health risks and improve health status of all. Health promotion initiatives include assessing awareness, building awareness of health problems and helping individuals in understanding the factors which are within the control of an individual to

avoid the risk of disease. The physical activity is important to prevent the various non-communicable diseases, growing epidemic of obesity and other disease is alarming. Teaching professionals gets less opportunity to engage in physical activity both at home and at work place, taking this into consideration the present study was under taken.

The present study is an ex post facto type of research (Kerlinger, 1983), in which factors related with health problems *viz*., diabetes, hypertension, high cholesterol and obesity have been explored 520 (254 male and 266 female) from different people of Thanjavur were selected following purposive sampling method for the present study. The age of the subjects ranged from 30 - 65 years.

CONCLUSION

While the problem of under-nutrition, communicable disease still exists in many parts of India, the additional burden of health problems like diabetes, high blood pressure, high cholesterol and obesity due to increasing sedentary lifestyle, junk food habits and stress in some urban and economically sound areas is really alarming. Prevention and control of these serious problems through proper pathway and awareness programs to adopt healthy lifestyle are urgent need of the hour.

REFERENCES

1. Bhalla, R., Kaoor satwanti, A.K. Kapoor and I.P Singh. 1983. The Distribution pattern of subcutaneous fat with refrence to level of physical activity in adult females. Z.Morph. Anthrop. 74: pp 191-197..
2. Bogin, B.A. and R.B Madvean. 1981. Nutritional and biological determinants of body fat pattering in urpan Guatemalan Children. Hum Biol. 53(4): pp 259-268. Cited by Kapoor Satwanti, Suman Verma and Manju Bhutani 1997. J.Hum. Ecol.8(4): pp 241-248.
3. Borkan G. and A.H Norris. 1971. Fat Redistribution and the changing body dimensions of adult males Hum. Biol. 49: pp 495-514. Cited by kapoor satwanti, suman verma nad manju bhutani. 1997. J. Hum.Ecol. 8(4): pp 241-248.
4. Brown, W.J. and Jones P.R.M 1977. The Distribution of body fat in relation to habitual activity. Ann. Hum. Biol. 4: pp 537-550. Cited by kapoor satwanti, Suman verma and manju bhutani. 1997. J. Hum .Ecol. M8(4): pp 241-248.

5. Choudhury, A.B. and K.Bose, 2000. A Review of Studies on Central Body Fat Distribution Among Indians. Salmoli Publication, Calcutta.
6. Damon, A., C.C.Seltzer., H.W. Stondt, and B Bell.1972. Age and Physique in healthy white veterans at boston. J. Gerontol. 27: pp 202-208.Cited by Kapoor Satwanti, Suman Verma and manju bhutani. 1997.J.Hum.Ecol.8(4): 241-248.
7. Darshna Tyagi. 2006. Medical Anthropology. Anmol Publication Pvt. Ltd. New delhi – 110002(india).
8. Das, Farida Ahamad. 1978. Somatometric Traits of the assamese Muslim in relation to Assamese Hindu Caste. Bull. Dbugarh University.26(20): pp 170-175.
9. Das. Anindita,. 2010. Post maritial changes of structural variavles in sedentary and active women. BR. J. Sports Med: 44. I33i34doi.10.1136/bjsm. 078725.109.
10. Edwards, D.A.W 1951. Differences in the distributation of subcutaneous fat with sex and maturity. Clin. Sci. 10: pp 305-315.Cited by kapoor Satwanti, Suman Verma and Manju Bhutani. 1997. J. Hum. Ecol:8(4) pp 241-248.
11. Garn S.M. 1955b. Relative fat pattering. An individual characteristics. Hum. Biol. 27: pp 75-89. Cited by Kapoor satwanti, suman verma and manju bhutani. 1997. J.Hum. Ecol. 8(4): pp 241-248.
12. Gillum, R.F.1987. Association of ratio of W/H Girth with blood pressure, serum cholesterol and serum uric acid(6-17 Year).J.Chron. Dis. 40: pp 413-420. Cited by kapoor satwanti, suman verma and manju bhutani. 1997. J.Hum. Ecol.8(4): pp 241-248.
13. Goran, M.l., M.Kaskoun, and W.P Shuma, 1995, intra abdominal adipose tissue in young childhood. Int. J. Obsity: pp 279-283. Cited by kapoor Satwanti, suman verma and manju bhutani. 1997. J.Hu. Ecol.8(4): pp 241-248.
14. Jonhston, F.E., I.J.Sanjeev and G.D Indeeh 1991. Fatness and fat patterning in 12 to 17 year old young from Chandigarh zone of north west india Am. J.Hum. Biol. 3: pp 587-597. Cited by Kapoor Satwanti, Suman Verma and manju bhutani. 1997. 8(4): pp 241-248 J.Hum. Ecol.
15. Katch , V.L., Compaigne, B.p. Freedson, S.Sady, F.L.Katch and A.R Behnke. 1980. Contribution of breast volume and weight to body fat distribution in females. Am. J.Phys. Anthrop. 53: pp 93-100. Cited by kapoor Satwanti, Suman verma and manju Bhutani. 1997. J.H.Hum.Ecol. 8(4): pp 241-248.
16. Khosla, T and C.R. Lowe, 1968. Height and weight of british men. Lancet: 1.742-745. Cited by Martha et.al., 1989. In Hum. Biol. 61(3): pp 415-425.
17. Mohan, v, S.Sandeep, R.Deepa, B.Shah and C.Varghese. 2007. Epidemiology of type 2 diabetes. Indian Scenario, Indian J. Med Res. 125: pp217-230.

18. Mohan,V., S.Sandeep, R.Deepa, B.Shah and C.Varghese. 2007. Epidemiology of type 2 diabetes. Indian Scenario, Indian J.Med. Res. 125: pp 217-230.
19. Mulleller, W.H and H.K.Kaplowitz. 1994. The Precision of anthropometric assessment of body fat distribution in children. Am. Hum. Biol.21: pp 267-274. Cited by kapoor satwanti, suman verma and manju bhutani. 1997. J.Hum. Ecol.8(4): pp 241-248.
20. Ramachandran, A., C.Snchalatha, and Vijay Viswanathamy. 2002. Burden of type 2 diabetes and its complications – The Indian scenario. Current Science. 8: pp 1471-1476.
21. Reynolds, E.l. 1951. The Distribution of subcutancous fat in childhood and adolescence. Monographs of society for Research in child Devepolpment 15, Serial no.0. Cited by kapoor Satwanti, Suman Verma and manju Bhutani. 1997. J. Hum. Ecol.8(4): pp 241-248.
22. Sandeep,S., Mr.A. Ganesan and Dr.V.Mohan Development and updation of the Diabeties atlas of india. Madras Diabetes Research Foundation Thanjavur.
23. Skerlj B., J. Brozek. And E.E. Hunt. 1953. Subcutaneous fat and age changes in body build and body from in women. Am. J. phys. Anthrop: 11 pp 577-600. Sloan, A.W., J.J. Burt and C.S.Blyth. 1962. Estimation of body fat in young women. J. Appl. Physil.17: pp 967-970.
24. Tanner. And g.Gleser 1951. The Effect of aging on stature. Am. J. Phys, Anthropl. 9(3): pp 311-324. Cited By Martha et.al., in Hum. Biol. June 1989, 61(3: pp 415-425).