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Physical activities and quality of life among elderly population in urban slum of Bardhaman Municipality, West Bengal.

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Abstract: ***Background:*** *Impact of physical activity on physical and psychological health is immense. Relation between physical activity and quality of life among elderly is not well explored in Indian research.*

Aim: *Present study aimed to assess the extent and pattern of physical activity, quality of life and their association among elderly slum population.* ***Methods:*** *A cross-sectional study was conducted during June – November 2017 among an estimated sample of 106 elderly persons (age ≥ 60 years) in a slum area of Bardhaman Municipality, West Bengal. Probability proportionate to population size (PPS) and simple random sampling technique was applied to select the subjects from six slums of the area. With informed consent, subjects were interviewed for background characteristics; physical activity status and their quality of life were assessed by Global Physical Activity Questionnaire (GPAQ) and World Health Organization Quality of Life Instrument – Older Adults Module (WHOQOL-OLD) respectively.* ***Results:*** *Among 106 elderly subjects, overall 66% were found to be physically active (MET-minute score ≥ 600) and 34% were inactive (MET-minute score < 600). Regarding activity at work place, 24% and 36% of them had vigorous and moderate intensity activities; 19.8% had experienced physical activity in terms of travel to and from places; 5.6 % and 17.9% of the respondents had vigorous and moderate intensity recreational activity respectively. In the study overall median score (IQR) of quality of life among the subjects was 62 (55-72). Age, occupational status, socio-economic status, family-type were significantly associated with quality of life. A positive association was found between physical activity (MET-minute score) and overall quality of life (WHOQOL-OLD total score). Among the facets of quality of life, facet 2 (Autonomy), facet 3 (Past Present and Future Activities) and facets 6 (Intimacy) had significant association with physical activity.* ***Conclusion:*** *Physical activity is positively associated with quality of life of slum dwelling elderly. Improving the pattern and level of physical activities among elderly is thus emphasized.*

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I. Introduction

The elderly population in India has undergone rapid growth with their improved life expectancy. The proportion of older persons has risen from 5.5% in 1951 to 6.5% in 1991, 7.7% in 2001, 8% in 2011 and projected 1% in 2025.[1] Changes in population structure will have several implications on health, economy, security, family life, and well-being. Modern science has an important role not only to add years to life but also to improve quality of life.

The concept of quality of life (QoL) is very broad and dynamic. According to the World Health Organization (WHO), it is the perception of the individuals' position in life, expectations, standards and concerns.[2,3] It is conceptualized as a generic and multidimensional parameter, describing an individual's subjective perception of his or her physical and psychological health, and social functioning. It also describes the quality of the environment in which the individual live, their opportunities in life and access to services, as well as issues referring to happiness, love, satisfaction with life and personal fulfillment.[4,5] Its measurements have typically included a series of life domains: physical, emotional, social, environmental, and material.[4]

As ageing takes the physical ability goes lower, the elderly individuals feel worthless and obviously experience a significant obstacle before them in gaining life satisfaction from life. The reduced physiological capacity evident with ageing may affect the ability to perform many tasks, potentially affecting QoL. The physiological process of aging is marked by a decrease in motor skills, reduced strength, flexibility, speed and hindering daily activities and maintenance of a healthy lifestyle and ultimately decrease in QoL.[6,7]In several studies it has been emphasized that there is an importance of physical activity or mobility as a way of improving organic conditions and slowing physical degeneration.[8] Evidences show the beneficial effect of an active life-

style, mainly if physical and functional autonomy can be maintained throughout aging: that minimizes degeneration improving health and QoL.[9]

It has also been shown that physical activity produces increased range of motion, strength of muscles and functional autonomy levels[10,11] and helps to reduce the likelihood of obesity, delays decline in functional abilities and the onset of chronic diseases. It improves mental health, promotes socialization and prolongs independent living.[12] Inclusion of balance promotion as an aspect of physical activity in older people is also important. Maintaining muscle strength and mass in older people will help in retaining the function and independence in them, will help them in weight management, and prevention of falls and other injuries thus, improving their QoL.[13]

In literature, the impact of physical activity on psychological health of individual is well-reported.[14-19] Studies are available showing the positive effect of physical activity on QoL specifically for elderly population.[20-22] In few studies, a negative or no association was also observed between physical activity and QoL,[23,24] which depends on the difference in methodology including scale used in assessment of QoL and profile of study population between the studies. However, evidence on this context in India is almost nonexistent. In the state of West Bengal also documented information is lacking.

Considering the lacunae in the existing literature, the present study was planned to assess the pattern and level of physical activities and the QoL among elderly persons in a slum area of Bardhaman Municipality, West Bengal. The study also aimed to find out the association between physical activities and QoL among the elderly people.

II. Material And Methods

Study design, study area and population

A community based cross-sectional study was conducted during June – November 2017 in urban slum area of a particular ward of Bardhaman Municipality of West Bengal which was selected randomly. The ward is a slum dominated area with six slums. Study subjects were elderly population (aged 60 years or more) living in those slums for at least six months.

Sample size and technique

Considering 45.6% of the people being physically active based on a study by Indian Council for Medical Research (ICMR)[25], 95% confidence interval, 10% allowable error and 10% non response rate, the minimum required sample size was estimated to be 106.

The sample of 106 elderly subjects was selected from the identified six slums of the study area as follows. At first, with the help of the local health workers the list of all elderly persons (aged 60 years or more) residing permanently at least for six months was prepared for these six slums. Elderly person who were severely ill physically and psychologically, required institutional care and who were physically handicapped since childhood were excluded. Total 106 elderly persons were included from these six slums according to their population proportion by applying probability proportionate to population size (PPS) sampling technique and ultimately the required numbers of elderly persons from each slum were selected by simple random sampling technique.

Data collection: tools and techniques

Data were collected at the household level. Selected elderly subjects were interviewed in face to face manner after obtaining informed consent, using the pre-designed pre-tested questionnaire for socio-demographic and background characteristics (age, gender, marital status, education, occupation, religion, type of family, income, presence of significant physical illness etc.)

Physical activity status and quality of life of the study subjects were assessed administering Global Physical Activity Questionnaire (GPAQ)[26,27] and World Health Organization Quality of Life Instrument – Older Adults Module (WHOQOL-OLD)[28,29] respectively.

Global Physical Activity Questionnaire (GPAQ)[26,27]: This scale was developed by WHO for physical activity surveillance. We get data on physical activity participation of one individual in three settings or domains (activity at work, travel to and from places and recreational activities) as well as sedentary behavior, comprising of 16 questions by showing 'show cards'. For the analysis of GPAQ data, Metabolic Equivalents (MET) score are commonly used to express the intensity of physical activities. MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy expenditure during sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour. During calculation of a person's total energy expenditure using GPAQ scale, his caloric consumption is four times high as compared to sitting quietly when he is moderately active and eight times high when he is vigorously active. As per WHO recommendations on physical activity, throughout a week, including activity for work, during transport and leisure time, one adult person should do at least 150 minutes of moderate-intensity physical activity or 75

minutes of vigorous-intensity physical activity or an equivalent combination of moderate and vigorous intensity physical activity achieving at least 600 MET-minutes.

In the present study physical activity in a typical week was calculated as MET-minutes and categorized into two groups- < 600 MET-minutes (inactive), and ≥ 600 MET-minutes score (active).

World Health Organization Quality of Life Instrument – Older Adults Module (WHOQOL-OLD)[28,29]: This scale was developed by WHO to assess QoL of elderly persons. It consists of 24 likert-scaled items assigned to six facets: 'sensory abilities', 'autonomy', 'past present and future activities', 'social participation', 'death and dying' and 'intimacy'. Each of the facets has 4 items, thus for all facets the score of possible values can range from 4 to 20. The scores of these six facets or the values of the 24 single items can be combined to produce a general score for quality of life in older adults, denoted as total score (range 24 to 120). High scores represent high QoL and vice versa.

Ethical considerations:

The research proposal was approved for ethical clearance from the institutional ethics committee of the Burdwan Medical College, West Bengal. Prior to data collection and assessment informed consent was obtained from each participant. Elderly persons requiring treatment after assessment were provided with necessary guidance and or measures.

Statistical analysis:

The collected data was rechecked for completeness and consistency, entered in the computerized program, on Excel data sheets and analyzed using statistical software SPSS-version 20. Descriptive statistics performed to present the data in tables and diagrams. After testing the normality of continuous data; Mann Whitney-U test and Kruskal Wallis test were used for the analysis.

III. Result

Socio-demographic profile:

A total of 106 elderly subjects were studied, among them 65% were women, majority were between 66 and 70 years of age (59%), married with living spouse (69%). 65% belonged to joint family and 72% were Hindu by religion. 62% of the subjects belonged to lower middle/ lower socio-economic class as per Modified BG Prasad Scale.

Pattern and level of physical activities:

Table 1 depicts the physical activity patterns of the study populations at work place; during travel and in recreational activities. The present study revealed regarding activity at work place, 24% and 36% of the respondents had vigorous and moderate intensity activities with median MET scores 2400 and 1590 respectively. 19.8% of the respondents had experienced physical activity in terms of travel to and from places. Regarding recreational activity 5.6 % and 17.9% of the respondents had vigorous and moderate intensity activities with same median MET score 960. All the study participants had experienced sedentary behavior with median MET score 1260.

Table 1: Pattern of physical activities in a typical week among slum dwelling elderly people (n=106)

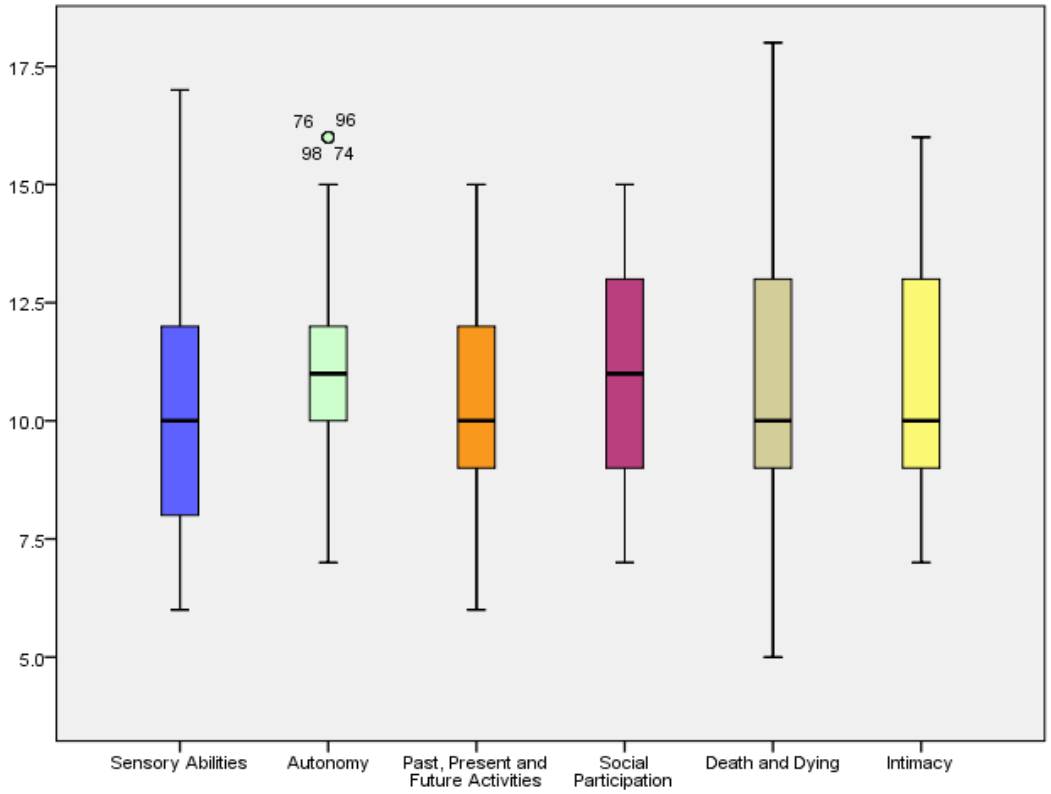
Pattern of physical activities	Frequency (Percentages)	Median MET- minute
Activity at work		
Vigorous intensity	26 (24.5)	2400
Moderate intensity	38 (35.8)	1590
Travel to and from places	21 (19.8)	720
Recreational activities		
Vigorous intensity	6 (5.6)	960
Moderate intensity	19 (17.9)	960
Sedentary behavior	106 (100)	1260
Total activities in MET-minutes		
MET Score < 600	36 (34)	120
MET Score ≥ 600	70 (66)	2460
Whole population	106 (100)	1770

Note: WHO recommends at least 600 MET-minutes of moderate and vigorous intensity physical activity in combinations in a typical week.

Level of Quality of Life:

Fig.1 depicts level of QoL of the study populations. In this study QoL of the study subjects was assessed by WHOQOL-OLD with its different facets. The median (IQR) score for facet-1 (Sensory abilities), facet-2 (Autonomy), facet-3 (Past Present and Future Activities), facet-4 (Social Participation), facet-5 (Death and Dying), facet-6 (Intimacy) of WHOQOL-OLD were 10(4), 11(2), 10(3), 11(4), 10(4), and 10(4) respectively. Further analysis revealed, overall median score (IQR) of quality of life among the subjects was 62 (55-72).

Fig. 1: Box Whisker plot showing quality of life score regarding various facets under WHOQOL-OLD.



(n=106)

Association between socio-demographic variables and quality of life:

Among the various socio-demographic variables studied, age (p=0.001), occupational status (p=0.001), socio-economic status (p=0.001), family type (p=0.001) of the respondents were significantly associated with QoL of elderly persons (Table 2).

Table 2: Association between socio-demographic variables and WHOQOL-OLD scores

Socio-demographic variables	WHOQOL-OLD Total Score Median (IQR)	'p' value/Significance
Age (in years)		p=0.001*
60-64	72 (61-76)	
65-69	63 (54-73)	
≥ 70	53 (48-57)	
Gender		p=0.166#
Male	61 (58-63)	
Female	67 (55-72.5)	
Marital Status		p=0.18#
Married with living spouse	63 (55-73)	
Widow/Widower	61 (53-72)	
Religion		p=0.684#
Hindu	61 (57-73)	
Muslim	68 (49-72)	
Educational status		p=0.365*
Illiterate	61 (56.5-67)	
Non formal literate	64 (53.75-72)	
Primary School	71 (53.5-76)	
Middle School	63 (59-73.75)	
Secondary and above	61 (58-82)	
Occupational status		p=0.001*
Business	61 (58-61)	
Rice mill worker	60 (53-65)	
Labourer	58 (52-71)	
Retired	81 (69-86)	
Housewife	69 (57-72)	
BMI		p=0.581*
<18.5	61 (58-79)	
18.5-24.9	63 (54-72)	
>24.9	61 (54-72)	

Socio-economic Status		p=0.001*
Upper & Upper Middle	79 (62-81)	
Middle	69 (61-75)	
Lower Middle &Lower	58 (53-68)	
Family type		p=0.001#
Nuclear	72 (61-79)	
Joint	61 (53-68)	
Presence of any chronic physical illness		p=0.625#
Yes	63 (55-74)	
No	61 (58-72)	

Mann Whitney U test used, *Kruskal Wallis test used

Association between physical activity and quality of life:

The findings of the showed elderly subjects with physical activity MET-minute score ≥ 600 had higher overall QoL score as compared to elderly subjects with physical activity MET-minute score < 600 (Table 3)

The study also revealed that QoL score in respect to three facets – facet 2, facet 3, facet 6 was significantly higher among elderly subjects with physical activity MET-minute score ≥ 600 as compared to subjects with MET minutes < 600. (Table 3)

Table 3: Association between physical activity (GPAQ - MET-minutes) and quality of life (WHOQOL-OLD scores)

Quality of life components	Subjects with physical activity (MET-minutes)		'p' value/Significance
	MET minutes < 600	MET minutes ≥ 600	
	Median (IQR)		
Total WHOQOL-OLD score	60 (54-62)	71 (55-76)	p=.003#
Facet-1 (Sensory Abilities)	10 (8-12)	10 (9-12)	p=.598#
Facet-2 (Autonomy)	10 (9-11)	11 (10-13)	p=.009#
Facet-3 (Past Present and Future Activities)	9 (9-10)	10 (9-13)	p=.004#
Facet-4 (Social Participation)	11 (9-11)	12 (9-14)	p=.049#
Facet-5 (Death and Dying)	10 (9-12)	11 (8-13)	p=.179#
Facet-6 (Intimacy)	9 (8-11)	11 (9-13)	p=.001#

IV. Discussion

Current study tried to ascertain the level and pattern of physical activities, QoLand their relation among the urban slum elderly population. Every community or geographical area has their own characteristics - trend, attitude and culture regarding their social and gender role and wellbeing at individual, family and the community levels. They try to cope up with these trends against various socio-economic adversities, especially for an urban slum community. Result from the present study might have similarities and differences with the observations from the other related studies available in the literature. Appropriate interpretations of such evidences would help identifying measures for addressing the issues.

An Indian study by Anjana RM et al conducted in four states (Tamilnadu, Maharashtra, Chandigarh and Jharkhand) reported nearly half of the population (54.4%) was inactive, 31.9% were active, 13.7% were highly active, as assessed by the same GPAQ scale used in the present study. Physical activity was measured there by MET-minutes and categorized into three categories into <600 MET-minutes (inactive), 600-1200 MET-minutes (active), > 1200 MET-minutes (highly active).[25] However, the present study revealed only 34% were inactive. Much higher proportion was found to be physically active/highly active as compared to the ICMR study[25] and the difference might be due to poor socio-economic status in slum population.

In another Indian study by Patil et al at Maharastra about 59% of the study subjects were found to be sedentary, 27% were having a moderately active lifestyle and 14% were having a vigorously active lifestyle where physical activity level was calculated using the principles of 1985 FAO/WHO/UNU expert consultation (WHO, 1985).[31] In the present study 24.5% and 35.8% of study subjects were found to do vigorous intensity and moderate intensity physical activity at their work place respectively. 19.8% of the respondents had experienced physical activity in terms of travel to and from places. Regarding recreational activity 5.6 % and 17.9% of the respondents had vigorous and moderate intensity activities respectively.

In the present study, autonomy and social participation facet-scores of WHOQOL-OLD were higher than the scores of the other facets. It was also observed that age, occupational status, socio-economic status,

family type of the respondents was significantly associated with total score of QoL and age was related with QoL in inversely proportionate way. Similar pattern of observation was also reported from an Indian study where QoLof elderly was assessed by WHOQOL-BREF Scale.[1] In that study it was observed that as the age increased, the QoL decreased in physical and psychological domains. Decrease earning ability, socio-occupational functioning and related psycho-social insecurities that aggravated with advancement of age, might be the possible explanation behind these observations.

In the present study positive association was found in between QoL and physical activity. Elderly person of whom physical activity was observed to be more than 600 MET-minutes, they had higher score than those whose physical activity was less than 600 MET-minutes. When individual facet scores were tested against physical activity of these two categories significant association was found in the facets of Autonomy, Past Present and Future Activities, Social Participation and Intimacy. Similar observations were also reported from a study conducted in Brazil by Pernambuco CS et al[16], they found better QoL in active group (group which was involved in a activity program for the purpose the study) as compared to inactive or control group.[16] In another study by Sarmiento among Colombian adults in Bagota[30], it was revealed that adults who reported engaging in leisure physical activities were more likely to have a higher mean score of QoL measured in the scale of Health Related Quality of Life (HR-QOL). In a study conducted in Brazil, authors did not found any association between age, gender with QoL and they observed that active elderly persons had better QoL scores than insufficiently active or sedentary individuals.[23] The primary objective of that study was to enumerate the difference in QoL between rural and urban population, both rural and urban population was included in that study that might be the possible reason behind this observation. But the present study was restricted to urban slum elderly.

While interpreting the findings some of the other limitations should also be considered: There is possibility of biasness in the data regarding the physical activity collected from the respondents in comparison to applying an activity program in a supervised environment. Result from a small sample of population in the present study may not be applicable on larger population, so there is need for study with large sample for generalization.

V. Conclusion

Average level of activity performed by the elderly population in urban slum area was high in respect to WHO recommendation. Among the socio-demographic variables, age, occupational status, socio-economic status, family type had association with QoL. Physical activity had an overall positive effect on QoL on the population included in the present study. So, awareness regarding improving the physical activity level in elderly person is needed to enhance their QoL.

References

[1]. Mudey A, Ambekar , Goya CR, Agarekar S , Wagh V.Assessment of Quality of Life among Rural and Urban Elderly Population of Wardha District, Maharashtra, India. Ethno Med. 2011; 5(2): 89-93

[2]. WHOQOL Group. The World Health Organization Quality of Life Assessment (WHOQOL): Development and general psychometric properties. Social Science & Medicine 1998; 46: 1569-1585. doi:10.1016/S0277-9536(98)00009-4

[3]. Figueira HA, Figueira OA, Figueira AA. Elderly Quality of Life Impacted by Traditional Chinese Medicine Techniques. Clinical Interventions in Aging. 2010; 5: 301-305.

[4]. Dykstra P. Older adult loneliness: Myths and Realities. European Journal of Ageing. 2009; 6: 91-100.

[5]. Netuveli G, Blane D. Quality of Life in Older Ages. Br. Med. Bull. 2008; 85:113–126.

[6]. De CA, Santos S, Cader SA, Dantas EHM, Helena M. Physical fitness of postmenopausal women submitted to a physical activities programme. Biomedical Human Kinetics; 2: 93-96.

[7]. American College of Sports Medicine (ACSM). Position stand. Exercise and Physical Activity for Older Adults. Medicine & Science in Sports & Exercise 1998; 30: 992-1008. doi:10.1097/00005768-199806000-00033

[8]. Siqueira Rodrigues BG, Cader SA, Bento Torres NV, Oliveira EM, Martin Dantas EH. Pilates method in personal autonomy, static balance and quality of life of elderly females. Journal of Bodywork and Movement Therapies.2010; 14(2): 195-202. doi:10.1016/j.jbmt.2009.12.005

[9]. Figueira H, Figueira J, Mello D, Dantas E. Quality of life throughout aging. Acta Medica Lituanica 2008; 15: 169-172.

[10]. Vale RGS, Oliveira RD, Pernambuco CS, Meneses YPSF, Novaes JS, Andrade AFD. Effects of muscle strength and aerobic training on basal serum levels of IGF-1 and cortisol in elderly women. Archives of Gerontology and Geriatrics 2009; 49: 343-347.

[11]. Tainaka K, Takizawa T, Katamoto S, Aoki J. Six-year prospective study of physical fitness and incidence of disability among community-dwelling Japanese elderly women. Geriatrics & Gerontology International 2009; 9: 21-28.

[12]. Australian Institute of Health and Welfare, Older Australia at a glance: 4th edition. 2007, AIHW: Cat. no. AGE 52. Canberra.

[13]. World Health Organisation, Keep fit for life: Meeting the nutritional needs of older persons. 2002: Geneva: WHO.

[14]. Pucci G, Reis RS, Rech CS, Hallal PC. Quality of life and physical activity among adults: population-based study in Brazilian adults. Qual Life Res DOI 10.1007/s11136-011-0083-5.

[15]. Sarmiento OL, Schmid TL, Parra DC, Díaz-del-Castillo A, Gómez LF, Pratt M, Jacoby E, Pinzón JD, Duperly J. Quality of Life, Physical Activity, and Built Environment Characteristics Among Colombian Adults. Journal of Physical Activity and Health, 2010, 7(Suppl 2), S181-S195.

[16]. Courneya KS, Friedenreich CM. Relationship between exercise during treatment and current quality of life among survivors of breast cancer. J Psychosoc Oncol. 1997; 15: 35–57.

[17]. Brown DR, Wang Y, Ward A, Ebbeling CB, Fortlage L, Puleo E, Benson H, Rippe JM. Chronic psychological effects of exercise and exercise plus cognitive strategies. Med Sci Sports Exerc. 1995; 27: 765–775.
[18]. McMurdo MET, Rennie L. A controlled trial of exercise by residents of old people's homes. Age Ageing. 1993; 22: 11–15.
[19]. Morgan K, Dallosso H, Bassey EJ, Ebrahim S, Fentem PH, Arie THD. Customary physical activity, psychological well-being and successful ageing. Ageing Soc. 1991; 11: 399–415.
[20]. Pernambuco CS, Rodrigues BM, Bezerra JCP, Carrielo A, Fernandes ADO, Vale RGS, Dantas EHM. Quality of life, Elderly and Physical activity. Health 4; 2012: 4(2) 88-93.
[21]. AlexandreI T, CordeiroII RC, RamosII LR. Factors associated to quality of life in active elderly. Rev Saúde Pública. 2009;43(4):613-621
[22]. Bendstrup KE, Jensen JI, Holm S, Bengtsson B. Out-patient rehabilitation improves activities of daily living, quality of life and exercise tolerance in chronic obstructive pulmonary disease. Eur Respir J. 1997;10:2801-2806
[23]. Ribeiro CG, Ferretti F, Antônio de Sá C. Quality of life based on level of physical activity among elderly residents of urban and rural areas.Rev Bras Geriatr. 2017;20(3): 330-339
[24]. Stewart AL, Mills KM, Sepsis PG, et al. Evaluation of CHAMPS, a physical activity promotion program for older adults. Ann Behav Med. 1997;19:353–361.
[25]. Anjana RM, Pradeepa R, Das AK, Deepa M, Bhansali A, Joshi SR, Dhandhania VK, Rao PV, Sudha V, Subashini R, Unnikrishnan R, Madhu SV, Kaur T, Mohan V, Shukla DK. Physical activity and inactivity patterns in India – results from the ICMR-INDIAB study. (Phase-1) [ICMR-INDIAB-5] Int J Behav Nutr Phys Act. 2014;11:1–11
[26]. World Health Organization. Global Physical Activity Questionnaire (GPAQ) analysis guide. Geneva: World Health Organization; 2012.
[27]. Global Physical Activity Questionnaire (version 2.0), http://www.who.int/chp/steps/resources/GPAQ_Analysis_Guide.pdf. Accessed November 13, 2014
[28]. Power M, Quinn K, Schmidt S, WHOQOLOLD Group. Development of the WHOQOL-Old module. Quality of Life Research 2005;14:2197-214
[29]. World Health Organization. WHOQOL Old manual. Copenhagen: WHO European office 2004 pp. 551-558
[30]. Patil C, Dhoble M, Kaware A. A Study of Physical Activity Levels and Its Correlates Among Adults: A Cross-Sectional Study. International Journal of Community Medicine and Public Health 2017;4(4):1154-1158
[31]. Shaheen M, Puri S, Tandon N. Physical Activity Measurement in Elderly: The Indian Scenario.Journal of Physical Activity Research 2016;1(1):9-14

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