# **Original Research Article**

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# Assessment of physical activity level among obese and non-obese individuals using global physical activity questionnaire

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#### **ABSTRACT**

**Background:** Physical inactivity is considered as a major independent modifiable risk factor for chronic diseases and is one of the most important causes of obesity. Considering the increasing prevalence of chronic diseases in India, the physical activity plays an important role. Taking this into consideration we conducted a study to assess the physical activity levels using the global physical activity questionnaire among obese and non-obese individuals.

**Methods:** A cross sectional study was conducted among adults 20-60 years age-group in rural and urban field practice areas of a medical college in Puducherry by simple random sampling method to select 237 individuals from each area. The level of physical activity was analysed using the global physical activity questionnaire.

**Results:** Among the study population, 61.39% belong to low physical activity level. Among 97 obese individuals, 53.61% belong to low physical activity and no statistical significance was noted between the levels of physical activity and obesity. The prevalence of obesity was 36.13% among those who reported walking and bicycle usage and statistical significance was noted among obese and non-obese individuals (p<0.001). Statistical significant difference was observed in duration of physical activity (minutes/day) among obese and non-obese individuals.

**Conclusions:** The prevalence of obesity seems to be lower among the people who practice simple day-to-day habits such as walking and usage of bicycles as evidenced from our study. Such simple and replicable behavioural modifications need to be brought about at a societal level, if we want to minimise the danger of the looming obesity epidemic.

**Keywords:** Physical activity, Obesity, Global physical activity questionnaire

## INTRODUCTION

Regular physical activity is the essential lifestyle behaviour for the growth and support of individual's health and well-being. It is the most effectual and simple way to reduce the risk of obesity. The physical activity is defined as any body movements that require energy consumption like sports and activities such as walking,

playing, cycling, skating, and cleaning, dancing or climbing stairs.

The insufficient physical activity is the risk factor for non-communicable diseases such as cardiovascular disease, diabetes mellitus, stroke, cancers and health outcomes such as mental health, injuries and obesity. A recent report from World Health Organization (WHO) estimates that the physical inactivity is the fourth major risk factor accounts for about 6% of the global death, with the others estimate at high blood pressure accounts for 13%, tobacco use 9% and high blood sugar 6%. And it is also revealed that, overweight and obesity accounts for 5% of global mortality. Obesity, which is resulted from the insufficient physical activity coupled with the consumption of junk food, is the most neglected public health problem and is a cluster of non-communicable diseases. <sup>1</sup>

According to a report from WHO, globally 23% of the adults aged 18 and above are insufficiently physically active. In developed countries, 26% of the men and 35% of the women whereas in underdeveloped countries 12% of the men and 24% of the women were not physically active.2 As per the directions of WHO, it is recommended that adults aged between 18-64 years should do regular moderate physical activities for at least 150 minutes or vigorous intense physical activity for 75 minutes throughout the week.3 Recently WHO has developed a questionnaire based tool named "The Global Physical Activity Questionnaire" to measure the levels of physical activity. It covers several components such as intensity, duration and frequency of physical activity and also assesses three domains of physical activity like work related activity, travel related activity, recreational and sedentary activity.4

Recent studies carried out in various parts of India, showed that the physical inactivity is on the rise, especially in urban areas due to the increased dependence on highly automated home appliances and utensils. <sup>6,7</sup> Most of the developing countries doesn't have adequate data on physical activity. <sup>7</sup>

Considering the importance of physical activity among adults, the present study aims to assess the physical activity levels using the global physical activity questionnaire among obese and non-obese individuals.

#### **METHODS**

A community based cross sectional study was planned and carried out to assess the physical activity among 20-60 years age group in rural and urban field practice areas of Mahatma Gandhi Medical College and Research Institute (MGMCRI), Puducherry. The study was conducted after obtaining the necessary clearance from Institutional Human Ethics committee. The study was conducted for over a period of one year from Sept 2014 to Oct 2015. The inclusion criteria were individuals of both sexes of age 20 to 60 years, those individuals who were living in rural and urban areas of Puducherry for more than last 6 months and those who gave informed consent for the study. The exclusion criteria were those individuals who were unable to participate like comatose patients, bedridden and seriously ill patients, pregnant and lactating mothers. The sample size was calculated using the formula recommended in the "WHO manual for sample size determination in health studies-1999." Prevalence of obesity in India among adults is 2.1% (BMI >30 is considered as obesity). Accounting for a 20% non-response rate, a sample size of 237 each was arrived at for the urban and rural areas. Hence the total sample size was 474.

Names of all persons aged 20-60 years residing in the field practice area of the UHTC / RHTC was extracted from the records available at the health centres. There were a total of 3857 'eligible' subjects in our UHTC registers and 2965 in our RHTC registers— this constituted our sampling frame. These individuals were serially numbered and simple random sampling technique was used to select 237 individuals each from the two lists. House-to-house visits were done to the selected persons' homes to collect data. Pregnant and lactating mothers, bedridden/seriously ill/comatose patients unable to participate were excluded from the study.

The questionnaire included sections on sociodemographic characteristics like age, gender and region. Questions pertaining to levels of physical activity were based on "The Global Physical Activity Questionnaire" (GPAQ), developed by WHO.<sup>9</sup> the three levels of physical activity were classified as low, Moderate and high. The criteria for these levels are shown below.

*High:* An individual who does vigorous-intense activity for 1500 MET-minutes/work for 3 days (or) walking along with moderate or vigorous intense activity for 3,000 MET-minutes per week for more than 1 week.

*Moderate:* An individuals who doesn't meet the high category level but who does Vigorous intense activity for at least 20 minutes per day for 3 or more days (or) moderate intense activity for 30 minutes per day for 5 or more days (or) walking along with moderate or vigorous intense activity for 600 MET minutes per week for 5 days or more.

Low: An individual who doesn't comply with the above criteria.

Physical activity scores were calculated using WHO's GPAQ analysis guide.<sup>4</sup> Height and weight were measured as per WHO recommendation on anthropometric measurements.<sup>10</sup> Body mass index was calculated using the formula weight in kilograms divided by square of height in meters. Using the calculated BMI, the individuals were classified based on World health classification for Asians.<sup>11</sup>

The purpose of the research study was explained to the respondents in local language and written format. Informed consent was obtained from those who were willing to participate. Willing respondents were interviewed using the above-mentioned questionnaire

tool. Adequate care was taken to maintain privacy and confidentiality while interviewing and examining.

The data collected was entered into Microsoft excel spread sheet and analysed using IBM SPSS Statistics, Version 22 (Armonk, NY: IBM Corp). Descriptive data were presented in the form of frequency, percentage for categorical variables and in the form of mean, median, standard deviation and quartiles for continuous variables. The categorical variables among the study groups were compared using the chi square test. Odds Ratios were calculated for quantifying the strength of associations. As the data were not following normal distribution, non-parametric test were used. Variation in the scores over

different time periods were compared using repeated measures ANOVA with Bonferroni post hoc test and Friedman test with Wilcoxon sign rank test. Mann Witney U test and Kruskall Wallis chi-square were used to compare levels of physical activity and BMI values. P<0.05 was considered as statistically significant.

#### RESULTS

Out of 474 individuals, 97 (20.46%) were found to be obese and 377 (79.54%) were found to be non-obese. Based on geographical location, the prevalence of obesity among urban area (29.5%) was significantly higher than the rural area (11.39%) (p<0.001) (Table 1).

Table 1: Body mass index based on geographical distribution (N=474).

Nutritional status (BMI)	Total (%)	Rural (%)	Urban (%)	Chi-square (P value)
Obese (>27.5)	97 (20.46)	27 (11.39)	70 (29.54)	
Non-obese (<27.4)	377 (79.54)	210 (88.61)	167 (70.46)	31.19 (<0.001)
Total (%)	474 (100)	237 (100)	237 (100)	

Table 2: Distribution of study population based on the global physical activity questionnaire (N=474).

Physical activity	Total (N)	Percentage (%)
High	78	16.46
Moderate	105	22.15
Low	291	61.39
Total	474	100

Table 3: Distribution of physical activity levels among obese and non-obese subjects.

Physical activity level Non obese Obese Odds ratio							
	(n=377) (%)	(n=97) (%)	( 95% CI)				
<b>High</b> 60 (15.92) 18 (18.56) 1.000							
<b>Moderate</b> 78 (20.69) 27 (27.84) 1.15 (0.58-2.29)							
<b>Low</b> 239 (63.39) 52 (53.61) 0.73 (0.4-1.33)							
Chi Square value(2) = $3.31$ , p = $0.19$ (NS)							
* 0.0% ( ' ' H ' ' ' ' ' ' O.0% NT ' ' ' ' ' ' ' NTG							

<sup>\*</sup>p<0.05 statistically significant, p>0.05; Non significant- NS.

Table 4: Comparison of selected global physical activity questionnaire items among obese and non- obese (N=474).

4    Moderate intensity activity    153 (32.28)    115 (75.16)    38 (24.84)    2.65    0.10 (NS)      7    Walk or use bicycle    119 (25.11)    76 (63.87)    43 (36.13)    23.97    0.001*	Q. no	Question	Total N (%)	Non-obese (N=377) (%)	Obese (N=97) (%)	Chi square	P value
7 Walk or use bicycle 119 (25.11) 76 (63.87) 43 (36.13) 23.97 0.001*	1	Vigorous intense activity	32 (6.75)	25 (78.12)	7 (21.88)	0.04	0.84 (NS)
	4	Moderate intensity activity	153 (32.28)	115 (75.16)	38 (24.84)	2.65	0.10 (NS)
Madanata intensity analyte City as	7	Walk or use bicycle	119 (25.11)	76 (63.87)	43 (36.13)	23.97	0.001*
13 Moderate intensity sports, itness or recreational activities 25 (5.27) 19 (76) 6 (24) 0.20 0.65 (NS)	13	Moderate intensity sports, fitness or recreational activities	25 (5.27)	19 (76)	6 (24)	0.20	0.65 (NS)

Chi square test; \*p<0.05 statistically significant, p>0.05; Non significant- NS

Table 5: Mean minutes of total physical activity on average per day (N=474)

	Non-obese (n=377)	Obese (n=97)
Mean TPA (SD)	21.02 (27.63)	26.20 (31.38)
Median (Q1, Q3)	0 (0, 51.42)	8.5 (0, 51.42)
U statistic value	15434.5	
P-value	0.01*	

Mann Whitney U test; \*p<0.05 statistically significant, p>0.05; Non significant- NS.

Table 6: Mean minutes of total physical activity on average per day in different physical activity level.

	Non- Obese	Obese
High	59.79 (21.50)	74.92 (21.90)
Moderate	39.30 (21.76)	30.26 (23.14)
Low	5.32 (14.22)	7.22 (14.42)
Kruskall Wallis chi square (df)	248.94 (2)	58.37 (2)
p-value	<0.001*	<0.001*

Kruskal Wallis test \*p<0.05 statistically significant, p>0.05; Non significant- NS.

Table 7: Mean minutes of total physical activity on average per day in different domains.

		Activity of work	Travel to and from places	Recreational activities	Sedentary activities
	Mean	18.77	2.08	0.16	18.23
	SD	26.78	4.76	1.28	8.19
Non obese	Q1	0	0	0	17.14
	Median	0	0	0	17.14
	Q3	42.85	0	0	17.14
Obese	Mean	22.00	3.87	0.32	18.34
	SD	30.22	4.91	1.47	8.41
	Q1	0	0	0	8.57
	Median	0	0	0	17.14
	Q3	47.14	8.57	0	25.71
Mann Whitney test	U statistic	17464.00	14067.50	17688.00	18197.50
Mann Whitney test	p- value	0.43(NS)	<0.001*	0.07(NS)	0.94(NS)

Mann Whitney U test \*p<0.05 statistically significant, p>0.05; Non significant- NS.

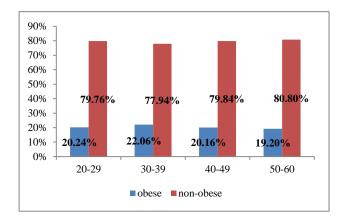


Figure 1: Comparison of prevalence of obesity among different age category.

Figure 1 to 3 shows comparison of prevalence of obesity among various demographic data such as age, sex and region.

Among the population studied, 61.39% fall under the 'low physical activity' category and 16.46% under the 'high physical activity' category (Table 2).

Table 3 shows the variation in the physical activity levels among obese and non-obese individuals. There was no statistically significant association noticed between the physical activity levels and obesity.

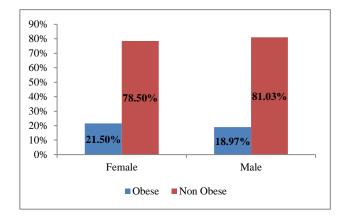


Figure 2: Comparison of prevalence of obesity among males and females.

Among those who use bicycle/walking, 63.87% were non-obese and 36.13% were obese. A significant association between the bicycle use/ walking and obesity was observed (p=0.001). Among those who do moderate intensity activity, 75.16% were non-obese and 24.84% were obese (Table 4).

Average time spent per day on total physical activity by non-obese subjects was 21.02 (27.63) min which was significantly lower than time spent by obese subjects 26.20 (31.38) min (p=0.01) (Table 5).

There was a significant difference in the time spent on physical activity between the levels of physical activities in both non-obese and obese individuals (p<0.001) (Table 6).

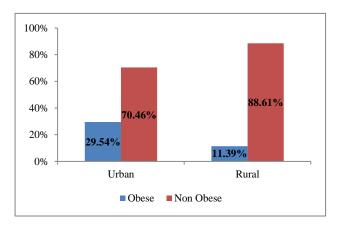


Figure 3: Comparison of prevalence of obesity among rural and urban areas.

There is a significant difference in the amount of time spent in the travel to and from places between obese and non-obese individuals (p<0.001). There is no significant difference in the amount of time spent in the activity of work, recreational activities and sedentary activities between obese and non-obese individuals (p>0.05) (Table 7).

#### **DISCUSSION**

The present study was carried out in rural and urban areas to assess the physical activity levels using the global physical activity questionnaire among adults aged 20 to 60 years

Among the study population, the majority of respondents (61.39%) belong to low physical activity category, whereas 38.61% belongs to moderate and high physical activity category. The number of subjects performing moderate and high intensity physical activity in this study is lower than the study reported by the WHO-ICMR Indian non-communicable disease risk factor surveillance (65%) in 2008. In the present study more subjects having low physical activity (53.61%) were obese as compared to high (18.56) and moderate (27.61%) physical activity. The reason for low physical activity may be physical inactivity during the daily routine activities and travelling. These individuals should be encouraged to improve their physical activities. In a similar study done in South India by Dutala et al about 22.2% belongs to low level, 73% belong to moderate and 4.8% belong to high level of physical activity. 12 In a ICMR-INDIAB study, the pattern of physical activity was assessed in four different areas of India (Tamil Nadu, Maharashtra, Jharkhand and Chandigarh) through a community based national survey and found that about 54.4% individuals were physically inactive and were more in the urban area (65% compared to rural area 50%). <sup>13</sup> In a study done in Hyderabad by Adepu et al, most of the participants had done moderate activity (58.7%) and low physical activity (39.35%) and was statistically associated with age, marital status, education and employment. In another study, the prevalence of engaging in >150 MVPA minutes/ week of physical activity was higher among normal weight compared to overweight and obese group and the association between BMI group and the prevalence of activity was not significant. Obese individuals showed significantly lower physical activity levels than the non-obese individuals (p=0.002).

Among those who do vigorous intense activity, 78.12% were non-obese and 21.88% were obese whereas among those who do moderate intense activity, 75.16% were non-obese and 24.84% were obese. This gives an impression that those who do vigorous and moderate intense activity were more likely to be non-obese. In a similar study, no significant difference were observed in the GPAQ according to self-reported minutes of moderate, vigorous or moderate-vigorous physical activity between BMI groups among both sex. <sup>15</sup> Another study done in Hyderabad, 16.6% had done vigorous intensity activity at work and 51.1% had done moderate intensity activity and statistical significance was noted with gender, age and marital status. <sup>14</sup> Another study done by Mogre et al about 53.3% of the individuals had done vigorous level of physical activity, 35.3% had moderate level and 11.4% had light level of physical activity. <sup>17</sup>

In this study, among those individuals who used bicycle/walking, 63.87% were non-obese whereas 36.13% were obese. This could be due to the active mode of transport in relation to their work place. Similar result was observed in a study done in urban slums of Faridabad<sup>18</sup> and in urban area of China, and the major part of physical activity was found to be related to work. <sup>19</sup>

Also among those who had moderate intensity sports/ recreational activities, 76% were non-obese and 24% were obese. Recreational activities included watching television, using mobile phones/ computers reading, gardening, etc. In a study done in Hyderabad, only few participants carried out recreational activity (vigorous-8.63%, moderate- 20.1%) and significant difference was observed between gender and type of employment. In another study done by Singh et al, there were about 74.4% third year students, 58.6% final year students, 53.8% interns and 52.1% faculty had done recreational activities and significant differences were noted in recreational activities between the various groups (p<0.001). 20

The duration of total physical activity (min/day) among obese individuals is 26.2 min/day which is significantly higher than that of mean total physical activity of non-obese individuals which is 21.02 min/day. A similar study showed that the mean total physical activity per week among boys was 46357 were non-obese and 34508 was obese and among girls the mean physical activity

levels were 37331 among non-obese and 28453 among obese. There is also statistical significance found between different physical activity levels in non-obese and obese participants. In a similar study done by Singh et al, the total physical activity measured in mean MET minutes per week was 625.6, 786.3, 296.5 and 296.5 for third year, final year students, interns and faculty and statistical significance were noted between the various group. In a study done in Haryana, the total median duration of physical activity in MET minutes per week had a statistical significant difference in both sex (p<0.001). The median duration of physical activity over past 1 week showed increase in rural (935) population when compared to urban (270) and semi-urban (280) population.

The mean minutes of total physical activity on average per day in travel to and from places among obese is 3.87 and non-obese is 2.08 and the differences were found to be statistically significant. Whereas the recreational, sedentary activities and activity of work among obese and non-obese were found to be statistically insignificant. In a similar study by Singh et al, the mean metabolic equivalents minutes per week in travel to and from places was reported as 212.9, 185.2, 167.2, 69.4 of the various dental health care professional groups and statistical significance were noted for activity at work, travel to and from places, and recreational activity between various dental health professionals groups.<sup>20</sup> In a study done in Haryana, Urban women (300 min/day) had a higher mean duration of time spent sitting or lying than rural men (180 min/day)and the difference was found to be statistically significant.<sup>21</sup>

## **CONCLUSION**

The results of the present study suggest that majority of study population belong to low physical activity level. Among obese individuals, 53.61% belong to low physical activity level.

Obesity was associated significantly with less walking and bicycle usage. People reporting day-to-day habits such as walking and usage of bicycles seem to have lower prevalence of obesity levels as evidenced from our study. These may be considered as good practices and such simple and replicable behavioural modifications need to be brought about at a societal level to bring down the risk of future complications.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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