Original Article

Prevalence of low physical activity, its predictors and knowledge regarding being overweight/obesity: A community-based study from urban South India

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Abstract

Introduction: Physical inactivity is the fourth leading risk factor for mortality and morbidity as per the World Health Organisation (WHO). The current study was conducted in the city of Erode, Tamil Nadu, South India, to estimate the prevalence and predictors of low physical activity (LPA) and assess their knowledge with regards to being overweight/obesity. **Methods:** It was a cross-sectional study conducted over 24 months from July 2015 to June 2017. Multi-stage random sampling was done in 12 randomly chosen corporation wards. All consenting individuals above 18 years of age were included. Data were collected using a semi-structured questionnaire incorporating the validated International Physical Activity Questionnaire (IPAQ). **Results:** For the study, 489 individuals were screened and 461 were included. Prevalence of LPA was 49.9% (95% confidence interval [CI]:45.34%, 54.46%). The significant predictors (adjusted odds ratio [OR] [95% CI]) of LPA were patient education 1.129 (1.006, 1.2670); unemployment (2.418 [1.610, 3.631]) and knowledge score (5.172 [1.314, 9.423] 27). In the knowledge assessment, 60.3% of the participants scored less than 50%. The significant predictors of poor knowledge were marital status (unmarried) (3.857 [1.341, 11.091]), lower educational status (1.191 [1.009, 1.362]) and low socioeconomic status (SES) (1.050 [1.005, 1.121]). **Conclusion:** Prevalence of LPA in our population is fairly high and there is gross knowledge inadequacy.

Keywords: Community-based research, epidemiology, obesity, overweight, physical activity

Introduction

Physical activity is defined as any movement produced by the skeletal or muscular system of the body that successfully elevates energy expenditure. Although used interchangeably, exercise is a subset of physical activity that is planned, structured, repetitive and purposive with the objective of physical fitness in mind.[1] People these days are able to link the lack of physical activity with the development of obesity. However, besides obesity, a wide range of health problems are associated with low physical activity (LPA), including non-communicable diseases (NCDs) like coronary heart disease (CHD), stroke and psychiatric illnesses.[2] According to the World Health Organisation (WHO), globally, physical inactivity is the fourth leading risk factor with an estimated 3.2 million annual deaths attributed to it.[3] India, as a developing country, has witnessed a 'double burden' epidemiological transition because of high rates of NCD morbidity and mortality, without substantial control of communicable diseases.[4] Such NCDs accounted for over 50% of deaths and 43% of the disability-adjusted life years (DALYs) lost in India in the last decade.[5] Studies have also shown a significant positive correlation between physical activity levels and reduced incidence of various types of ailments.[6] Being 'overweight' or 'obese' are terms used to quantify weight

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and body mass index (BMI), and they serve as a crude measure for defining these conditions, where a BMI ≥25 kg/m^2 is overweight and BMI ≥30 kg/m^2 is obese.[7] However, because of higher percentage of body fat in Asian population, the WHO recommended two additional trigger points for public health action at BMI ≥23 kg/m^2 (associated with increased co-morbidity risk) and BMI ≥27.5 kg/m^2 (associated with high risk).[8,9] Many nations in South East Asia, especially India, are undergoing a 'nutritional transition' favouring being overweight/obesity since the 1990s and such a transition is multi-factorial, involving factors like LPA, improper dietary habits, poor awareness about the ill effects of obesity and so on.[10] With this background, we proposed to conduct a study among people living in Erode, a South Indian city in the state of Tamil Nadu to describe their physical activity levels, estimate the prevalence and predictors of LPA and assess their knowledge with regards to being overweight/obesity.

Methods

This was a cross-sectional study conducted over a period of 18 months from July 2015 to December 2016. All consenting adults (>18 years of age) of both genders, who were permanent residents of Erode city, were included. Those with a serious illness, dementia, being bed-ridden or with any psychiatric illnesses with associated loss of insight were excluded. Multi-stage random sampling was done. Twelve corporation wards were chosen from the 60 wards demarcated in the Erode city based on electoral roll, and each of these wards was considered as one stratum. Then, systematic random sampling was done to choose the households in each stratum (wards). To do this, a random street was chosen from the list of streets available on the electoral roll using a random number table. From the centre of this street, every nth house was chosen based on a throw of die (n = 1–6).

Every household was considered as a cluster, and we arbitrarily chose the average cluster size to be three. The estimated prevalence based on a pilot study of 20 patients (P) was 40%. With anα error of 5%, power of 80% and absolute precision of 5%, the sample size calculated was 369. To compensate for clustering, the sample size was increased by multiplying it with a design effect (DE), where DE = 1 + ρ (cluster size- 1); ρ is correlation co-efficient, which was arbitrarily taken as 0.1. Thus, the final calculated sample size was 460 individuals.

After obtaining the written informed consent, a semi-structured pilot-tested standardised questionnaire was administered. The questionnaire contained components including, socio-demographic details, International Physical Activity Questionnaire (IPAQ) short version and knowledge questionnaire on being overweight/obesity and its ill effects. The IPAQ (short version) is a validated questionnaire, which has four questions about the duration in minutes of physical activity, whether high intensity, moderate intensity, walking or sitting, performed in a regular week.[11] These questions were supplemented with the WHO show cards that depict pictorially various high- and moderate-intensity activities.[12] The knowledge questionnaire had 15 multiple choice questions that tested the participants' knowledge of the aetiology and ill-effects of excessive body weight.

Data were collected by two trained data collectors, who were personally trained by the principal investigator. They collected the pilot study data under the direct supervision of the study investigators. Once adequately trained, they were permitted to go into the community for data collection. Quality assessment was done periodically by resampling 10% of the already recruited participants in a random fashion. Data entry was performed using Epi Info™ Version 7 (Publisher: CDC, USA, 2011).

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software for Windows, version 20 (Publisher: IBM Corp., USA, 2011). Demographic characteristics, including socioeconomic status (SES) based on the Kuppuswamy's SES scale,[13] physical activity levels and responses to knowledge questionnaire were summarised using descriptive statistics. The prevalence of LPA was represented as a proportion and 95% confidence interval (CI). The predictors of LPA were subjected to simple regression and those whose significance was less than 0.2 were included in the multivariate analysis model using binary logistic regression. Statistical significance was set at a $P > 0.05$. Ethics approval was obtained from the institutional ethics committee (it was approved in 17 May 2015) and the results have been reported here in accordance with the 'Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE) guidelines.[14]

Results

A total of 489 participants were screened and 461 were enrolled. The reasons for exclusion were serious illness (n = 15), being bed-ridden (n = 4) and dementia (n = 9). The mean (standard deviation [SD]) age of the study participants was 42.57 (15.37) years. The majority (72.7%) of the participants were women and 93.3% were married. There were nearly equal numbers of employed and unemployed participants, and approximately two-thirds (64.2%) of the participants belonged to the middle SES class. The socio-demographic characteristics are depicted in Table 1.

The prevalence (95% CI) of LPA among our study population was 49.9% (45.2, 54.6). The proportion (95% CI) of participants who were categorised to have moderate physical activity was 29.1% (25.0, 33.4) and those with high physical activity was 21.0% (17.4, 25.1). Age, female gender, marital status, participant's education, unemployment, knowledge score and SES class were subjected to univariate analysis to identify the predictors of LPA. All factors except age, marital status and SES with P value > 0.2 were included in the binary logistic regression. The factors (adjusted odds ratio [OR] [95% CI], P value) that came out as significant predictors of LPA were patient education (1.129 [1.006, 1.2670, 0.039]);

unemployment (2.418 [1.610, 3.631], $P < 0.001$] and knowledge score (5.172 [1.314, 9.423], 0.027). Table 2 describes the results of the univariate and multivariate analysis of these predictors.

The mean (SD) knowledge score obtained was 7.00 (2.19) out of 15. In the knowledge score, 60.3% of the participants scored less than 50%. Some of the salient findings are that only 63.8% felt the cause of obesity was LPA and a mere 51.6% of the participants were aware that increasing physical activity can maintain body weight. Approximately, three-fourths of the participants identified obesity to increase the risk of diabetes mellitus, hypertension, stroke and myocardial infarction (MI). The complete list of knowledge questions and percentage correct responses are tabulated in Table 3. The factors including age, female gender, marital status, education, unemployment and SES were subjected to univariate analysis and all factors except gender and unemployment with $P > 0.2$ were subjected to multivariate analysis. The factors (adjusted OR [95% CI], *P* value) that came out as significant predictors of poor knowledge were marital status being unmarried (3.857 [1.341, 11.091], 0.012), lower educational status (1.191 [1.009, 1.362], 0.036) and low SES (1.050 [1.005, 1.121], 0.027). Table 4 describes the results of the univariate and multivariate analysis of the predictors of poor knowledge.

Table 1: Socio-demographic characteristics

Variable	Frequency (%); *n*=461
Age (years)	
18-39	79 (17.1)
40-59 years	184 (39.9)
60 years and more	198 (43.0)
Sex	
Female	335 (72.7)
Male	126 (27.3)
Marital status	
Married	430 (93.3)
Unmarried	31 (6.7)
Education	
Illiterate/primary school	258 (56.0)
Middle and high school	131 (28.4)
Post-school diploma/graduate	72 (15.6)
Occupation	
Unemployed	226 (49.0)
Employed	235 (51.0)
Family SES[14]	
Lower	150 (22.6)
Middle	296 (64.2)
Upper	15 (3.3)

SES=Socioeconomic status

Table 2: Predictors of LPA

Variable	Univariate analysis		Multivariate analysis	
	OR	*P*	Adjusted OR (95CI)	*P*
Age	1.006	0.364	Not included	
Female Sex	2.024	0.001	1.304 (0.817, 2.079)	0.266
Marital status	1.424	0.348	Not included	
Patient education*	1.139	0.019	1.129 (1.006, 1.267)	0.039
Unemployment	2.623	<0.001	2.418 (1.610, 3.631)	<0.001
Knowledge score	6.083	0.023	5.172 (1.314, 9.423)	0.027
SES	1.009	0.575	Not included	

*Based on Kuppuswamy's SES scale education categories.[13] LPA=Low physical activity, OR=Odds ratio, 95CI=95% confidence interval, SES=Socioeconomic status

Discussion

Erode city is the seventh-largest urban agglomeration of Tamil Nadu, a South Indian state, and it is located on the banks of the Kaveri river. This city is known for its agricultural, food processing and textile industries. According to the 2011 census, Erode had a population of 521,776; sex-ratio of 996 (national average 929) women per 1000 men and a literacy rate of 85% (national average 73%).[15] In our study, we report that almost half the study population has LPA. This finding is similar to the findings of the Indian Council of Medical Research–India Diabetes (ICMR–INDIAB) study, which was done among 14,227 individuals from four regions of India, namely, Tamil Nadu, Chandigarh, Maharashtra and Jharkhand, and it reported that 54.4% of the participants were physically inactive.[16] Studies have shown that regular moderate-intensity physical activity delays

Table 3: Knowledge assessment

Knowledge Questions	Correct response *n*=315 (%)
Obesity is the leading preventable cause of death	134 (43.5)
Fat accumulation is the reason for obesity when compared to muscle, body water or bone weight	228 (72.4)
Obesity can increase the risk of diabetes mellitus	197 (62.5)
Obesity can increase the risk of hypertension	223 (70.8)
Obesity can increase the risk of MI	132 (41.9)
Obesity can increase the risk of stroke	231 (73.3)
Overeating causes obesity	207 (65.7)
LPA causes obesity	201 (63.8)
Obesity has a genetic predisposition	125 (39.7)
Eating rice increases body weight	99 (31.4)
Women are at higher risk of developing obesity	102 (32.4)
Carbohydrates lead to obesity	61 (19.4)
The fibre content in food helps counter weight gain	47 (14.9)
Fat deposition around organs of the abdomen has the highest risk	142 (45.1)
Exercising regularly is the best method to maintain a normal weight when compared to skipping meals	162 (51.4)

MI=Myocardial infarction, LPA=Low physical activity

Table 4: Predictors of poor knowledge

Variable	Univariate analysis		Multivariate analysis	
	OR	*P*	Adjusted OR (95CI)	*P*
Increasing Age	1.025	0.010	1.019 (0.996, 1.043)	0.109
Female Sex	1.008	0.975	Not included	
Unmarried	1.949	0.173	3.857 (1.341, 11.091)	0.012
Participant's education*	1.280	0.001	1.191 (1.009, 1.362)	0.036
Unemployment	0.788	0.303	Not included	
Low SES	1.097	0.001	1.050 (1.005, 1.121)	0.027

*Based on Kuppuswamy's SES scale education categories.[14] OR=Odds ratio, 95 CI=95% confidence interval, SES=Socioeconomic status

the onset of approximately 40 chronic conditions/diseases.[17] Physical activity is also known to allay the stress of daily work, reduce anxiety and improve cognitive functioning, functional capacity, psychological well-being and social inclusion.[18] Despite various guidelines and documented health benefits of physical activity, approximately two-thirds of the patients at the primary care level do not receive physical activity counselling from their doctors.[19] Thus, every primary care physician should make it a routine to screen for LPA and provide appropriate counselling as a mode of primordial prevention of lifestyle diseases.

Participants with a low educational status had a 13% increased chance of being categorised as LPA. Similarly, individuals who scored less than 50% in the knowledge score had five times the increased odds of being categorised as LPA. A large multi-national, cross-sectional study with 5,874 school children aged 9–11 years claimed that children in low- and middle-income countries who took physical education classes 1–2 times/week had a low chance of developing a sedentary behaviour in- and out-of-school. Men had a 2.3 times decreased risk and women had 4 times the decreased risk of developing a sedentary lifestyle outside the school hours, possibly because of the knowledge obtained through the classes, besides the benefits perceived by them directly as a result of enhanced physical activity.[20] Finally, we report that the participants who were unemployed had 2.4 times the increased chance of having LPA. This association is also proved from prior studies, where one study with 4,245 participants claimed that unemployed individuals had 1.5 times the increased odds of having poor physical activity.[21] Though there was no statistical significance, we could note a trend towards women being at higher risk for LPA. This finding once again corroborates findings from other studies done in India. As per a study done in Kolkata among 1,652 adolescents, men were 3 times more likely to engage in moderate to vigorous exercise (adjusted OR = 3.40).[22] Even in the ICMR–INDIAB study, 59.6% women were inactive when compared to 40.3% men ($P < 0.001$).[16]

Obesity is increasing at an alarming rate in both developed and developing populations. Though obesity in developing nations is not rising on par with Western society, it is still present in the faster developing urban regions of such nations.[23] As mentioned earlier, poor knowledge is a risk factor of LPA, which in turn can increase the burden of being overweight/obesity. From the knowledge assessment we made, we deduce that only 63.8% of the study population are aware that LPA can lead to obesity and only 51.4% considered exercising as the best method to maintain body weight when compared with other methods like skipping meals. We also report that a majority of our population were not aware of the right type of diet that prevents weight gain. For example, only 19.4% felt carbohydrates as the main dietary nutrient responsible for weight gain and a mere 14.9% identified that increasing fibre content in food protective towards overweight. The knowledge regarding outcomes of obesity was also poor. Only 41.9% were aware that obesity can increase the risk of MI. Whereas, 62.5%, 70.8% and 73.3% of the participants were aware that there is an increased risk of diabetes mellitus, hypertension and stroke, respectively, in overweight individuals. The multivariate analysis of predictors of poor knowledge score showed that being single has approximately 4 times the increased odds. Similarly, poor educational qualification and low SES had 19% and 5% increased chance of having poor knowledge, respectively. These findings are in accordance with other studies published from the other developing countries. A study from Bangladesh, which was conducted among 160 type 2 diabetic patients, found that there was a significant association between educational qualification ($P < 0.0001$) and knowledge score on obesity.[24] Another study from 1,272 ninth-grade students from six Latin American countries, which evaluated in detail the knowledge on weight loss methods, dietary habits to prevent obesity and relation between health and obesity, found that there was a significant association ($P < 0.01$) between knowledge scores in each of these domains and low SES.[25] We recommend that an evaluation of baseline knowledge of any population is important, as prevention and medical management of obesity largely depends on their knowledge and motivation to bring about a behavioural change.[26] It is widely believed that knowledge regarding the health risk of obesity motivates people to take appropriate measures to lose weight and lead a quality life.[27]

The strengths of our study are that it is a community-based study with a strong emphasis on sound epidemiological techniques in sampling. A fairly good number of participants ($n = 461$) have been enrolled to make meaningful interpretations. Our study, however, has a few limitations. There were a greater number of women in the study population because men had been to work while we approached the families for data collection. A similar issue we faced with regards to the age group being less than 40 years. Finally, though the IPAQ is a validated scale to measure physical activity, it cannot be compared as equivalent to objective measurement methods like calorimetry, which can measure energy expenditure prospectively.[28]

In conclusion, we report that the prevalence of LPA among our study population is fairly high (approximately 50%), despite greater awareness on the role of physical activity in reducing body weight. However, there is gross knowledge inadequacy with two-thirds of the population scoring less than 50% of the score. This warrants regular screening of all adult patients by general practitioners (GPs) to assess their physical activity levels and knowledge and provide systematic education on importance of enhancing physical activity levels. The factors that seem to favour LPA are unemployment, lower educational status and poor knowledge regarding ill-effects of being overweight/obesity. These individuals may be considered as high risk for LPA and must be appropriately counselled. With most recent studies identifying the high burden of LPA, we recommend further interventional studies to motivate people on enhancing physical activity.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have

given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflict of interest

There is no conflict of interest.

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