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Study of overweight and obesity and its risk factors among adults in an adopted urban slum area of Government Medical College, Miraj

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ABSTRACT

Background: Obesity and overweight are creating a global epidemic. In 2008, more than 1.4 billion adults were overweight worldwide. Rapidly changing diets & lifestyles are fueling the global epidemic. Once being considered as a problem related to affluence, obesity is now growing fast in many developing countries. The burden of slum population & magnitude of their health problems are on the rise. Thus, the present study was planned to determine the prevalence of overweight & obesity and its risk factors in the urban slum area.

Methods: A cross sectional study was carried out among adults aged 20 – 60 years. Persons willing to participate and who were residing more than 6 months in the study area were included. The sample of 320 was calculated with absolute error of 5%. Duration of study was from Feb 2014 to Dec 2014. Pretested Predesigned Proforma was constructed and Systematic random sampling method was used for data collection.

Results: In this study, the prevalence of overweight and obesity was 9.7% and 16.6% respectively. The study shows significant association between age, gender, occupation, family history of obesity, intake of calories and physical activity with overweight/obesity.

Conclusions: The prevalence of obesity was more in females. Obesity can occur at any age and generally increases with age. The prevalence was more in adults who had family history of obesity. Low levels of physical activity are associated with higher prevalence. Thus, participation in household activities and regular physical exercise could help in lowering the prevalence.

Keywords: Overweight, Obesity, Risk factors, Adults, Slum area

INTRODUCTION

Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size or an increase in fat cell number. Obesity is expressed in terms of Body Mass Index (BMI). The latest WHO projections indicate that at least one in three of the world's adult population is overweight and almost one in ten is obese. Worldwide, obesity has nearly doubled since 1980. In 2014, more than 1.9 billion adults were overweight. Of

these over 600 million were obese. 39% of adults aged 18 years and over were overweight in 2014, and 13% were obese. Most of the world's population live in countries where overweight and obesity kills more people than underweight.³ India & many other countries in the South-East-Asia are currently going through the so called 'nutrition transition' which is associated with a change in the structure of the diet & rapid increase in the prevalence of obesity.^{4,5}

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Obesity and overweight are creating a global epidemic and has reached epidemic proportions in India in the 21st century with morbid obesity affecting 5% of the country's population.⁶ According to National Family Health Survey-3 (NFHS-3) in India, obesity and overweight are 3 times higher in urban areas than in rural areas & more in women.^{7,8} The burden of slum population & magnitude of their health problems are on the rise. There is a rising prevalence of obesity among slum population.⁹ Rapidly changing diets & lifestyles are fueling the global epidemic. Once being considered as a problem related to affluence, obesity is now growing fast in many developing countries.¹⁰

In Asian population, the health risks which are associated with overweight & obesity occur at lower levels of BMI than in North America or Europe & lower cut-off levels for BMI are used to categorize overweight and obesity for Asian population (BMI above 23). The body mass index (BMI) has been traditionally promulgated by the World Health Organization as a useful indicator of obesity. Innumerable number of studies has documented the prevalence of obesity and overweight among different populations using this index. 11

Overweight & obesity are associated with increased burden of Diabetes, Hypertension, Cardiac diseases, some type of cancers (endometrial, breast etc.) and premature mortality but also with social and psychological effects of excess weight. Hence, to assess the prevalence of overweight/obesity and its risk factors in an urban slum the present study was conducted.

Objectives

- 1. To determine the prevalence of overweight & obesity among the adults in an adopted urban slum area.
- 2. To find out certain risk factors associated with overweight & obesity among the study population.

METHODS

A cross sectional study was carried out in the adopted community of Urban Health centre of Community Medicine Department, Government Medical College Miraj among adults aged 20 - 60 years. Persons willing to participate and who were residing more than 6 months in the study area were included. Seriously ill, bed ridden persons and pregnant women were excluded. Total population of the adopted urban slum area was 3500 and the adult population of age group 20 - 60 years were 1528. (Source - updated register of the adopted slum area). In order to calculate the sample size, the prevalence of overweight/obesity among adults was taken according to national family health survey (NFHS-3), Maharashtra i.e. 27.5%. 13 The sample of 320 was calculated with absolute error of 5%. Duration of study was from February 2014 to December 2014. A Systematic random sampling method was used for data collection. All the families residing in the locality were visited and the

proforma duly filled on interviewing and examining all the persons of age 20-60 years. The house locked and those who were not available during visits were revisited and likewise all the study population was covered.

Systematic random sampling⁹

Total no. of houses in study area -738. Sample size -300. Total Adult population (20-60 years) - 1528.

In order to select 320 persons, number of houses to be surveyed in the study area was

 $= \frac{\text{Total no of houses} \times \text{sample size}}{\text{Total adult population}}$ $= \frac{738 \times 320}{1528} = 154$

Sampling Interval = $\frac{Total\ no\ of\ houses\ in\ study\ area}{No\ of\ houses\ to\ be\ surveyed}$

$$=\frac{738}{154}=5$$

The houses in the slum were numbered. The first sample household was selected randomly by choosing a number (by a lottery method) within the sample interval. The next household was identified by adding the sampling interval with the first randomly chosen number. In the present study, the first randomly chosen number was 2, and the first household which was surveyed was house number 2. The second household was 2+5=7 i.e., the 7th household. The subsequent households were selected by the same method till the expected sample size was reached. Informed consent was obtained from the study subjects.

A Pretested Predesigned Proforma was used. It consisted of socio-demographic profile, family history, dietary history by 24 hour oral recall questionnaire method, physical activity and anthropometric measurements. Kuppuswamy Socio-economic classification was used. History of Physical activity of the study population was asked by using the International Physical Activity Questionnaires (IPAQ) and after analysis of IPAQ, study population were graded as Inactive, Minimal active and HEPA active (health enhancing physical activity; a high active category) by calculating the MET score (METs are multiples of the resting metabolic rate) to yield a score in MET Minutes. 15

All study subjects were weighed in the clothes they had worn. The Weighing machine was regularly standardized with a known weight. The adults were instructed about the procedure. The scale was readjusted to zero after weighing each adult. They were made to stand erect with both feets together without any support, looking straight with vision fixed on a point on the opposite wall such that the plain of vision was perpendicular to their body and parallel to the ground. The measurements were recorded

to the nearest of 0.5 kg. Measurements for height were plotted on the wall using a non-elastic measuring tape. Erect heights were obtained with the subjects standing barefoot on the flat surface, against the vertical wall with occiput, buttocks and heel touching the wall and arms hanging freely on the sides. A non-elastic plastic ruler was used to localize the upper limit of height measurements. Heights measurements were recorded to the nearest of 0.5 cm. WHO Asian classification was used for Calculation of Body Mass Index (BMI) and is expressed as weight (kg) divided by height (m²) (Table 1). ^{16,17}

Table 1: WHO Asian classification.

Nutrional status	BMI (kg/m²)
Underweight	<18.5
Normal	18.5 - 22.9
Overweight	≥23
At Risk	23 - 24.99
Obese I	25 - 29.99
Obese II	≥30

The necessary permissions were obtained from Head of department of Community Medicine Department and

Ethical committee. Analysis was done with appropriate statistical techniques using Microsoft excel, SPSS 21, Primer and Chi square value was calculated.

RESULTS

In this study, the prevalence of overweight was 9.7% and the prevalence of obesity was 16.6%. The prevalence of overweight was more in males (12.5%) as compared to females (6.3%) and the prevalence of obesity was more in females (25.7%) as compared to males (9.1%) (Table 2). 48.3% of the overweight/obese adults were in the age group of >50-60 years (Table 3). It is found that there is very highly significant association between age and overweight/obesity (p <0.001) and also significant association was observed between gender and overweight/obesity (p <0.05). The development of obesity is statistically more in females as compared to males. It was seen from the Table 5, 44.9% overweight/obese were housewives. A highly significant association was noted between occupation and overweight/obesity (p <0.01). Out of 140 adults who had family history of obesity, 32.9% were overweight/obese (Table 4). It is seen that there is significant association between family histories of obesity with the development of obesity (p < 0.05).

Table 2: Prevalence of overweight and obesity.

BMI		Male		Female		Total	
Category	kg/m ²	Frequency	%	Frequency	%	Frequency	%
Underweight	< 18.5	10	5.7	24	16.7	34	10.6
Normal	18.5 - 22.9	128	72.7	74	51.4	202	63.1
Overweight	23 - 24.99	22	12.5	9	6.3	31	9.7
Obese I	25 - 29.99	16	9.1	32	22.2	48	15
Obese II	≥ 30	0	0	5	3.5	5	1.6
Total		176	100	144	100	320	100

Table 3: Age and overweight/obesity.

Age in completed	Overweight/Obese	Non Obese	Total	
years	BMI ≥ 23	BMI < 22.99	Total	p- value
20 – 30	24 (17.1)	116 (82.9)	140 (100)	
> 30 – 40	18 (23.6)	58 (76.3)	76 (100)	
> 40 – 50	28 (37.3)	47 (62.7)	75 (100)	
> 50 - 60	14 (48.3)	15 (51.7)	29 (100)	< 0.001
Total	84 (26.2)	236 (73.8)	320 (100)	

No significant association was noted between religion, education, socio-economic status, type of family with overweight/obesity.

The dietary history was collected using 24 hour Recall Questionnaire method and calorie intake of every adult was calculated. The calorie requirement of the participants was calculated using per kg requirement according to expected body weight which was calculated

by using Broca's index. It is observed from table no.6 that, majority were of mixed type of diet and very highly significant association was noted with intake of calories and overweight/obesity (p <0.001). And also very highly significant association was found between eating salads and fruits with the development of obesity (p < 0.001). Also it is observed that that there is no significant association between intake of sweets, snacks and fast foods in between meals with the development of obesity (p >0.05).

Table 4: Gender, religion, type of family, family history of obesity and overweight/obesity.

		Overweight/Obese BMI ≥ 23	Non obese BMI < 22.99	Total	p-value	
Gender	Male	38 (21.6)	138 (78.4)	176 (100)	0.036	
Gender	Female	46 (31.9)	98 (68.1)	144 (100)	0.030	
Religion	Hindu	56 (26.9)	152 (73.1)	208 (100)	0.709	
Kengion	Muslim	28 (25)	84 (75)	112 (100)		
	Nuclear	42 (27.5)	111 (72.5)	153 (100)		
Type of family	Joint	24 (23.8)	77 (76.2)	101 (100)	0.790	
	Three Generation	18 (27.3)	48 (72.7)	66 (100)		
Family history of obesity	Yes	46 (32.9)	94 (67.1)	140 (100)	0.018	
	No	38 (21.1)	142 (78.9)	180 (100)	0.018	

Figures in parentheses indicate percentage.

Table 5: Education, occupation, socio-economic status and overweight/obesity.

		Overweight/ Obese BMI ≥ 23	Non obese BMI < 22.99	Total	p-value	
	Illiterate	7 (38.9)	11 (61.1)	18 (100)	•	
Education	Literate	77 (25.5)	225 (74.5)	302 (100)	0.328	
	Profession/semi profession	9 (21.4)	33 (78.6)	42 (100)		
	Skilled	10 (14.1)	61 (85.9)	71 (100)		
Occupation	Semi-skilled	27 (27.8)	70 (72.2)	97 (100)	<0.001	
	Unskilled	3 (11.1)	24 (88.9)	27 (100)		
	Unemployed	0 (0)	5 (100)	5 (100)		
	Housewife	35 (44.9)	43 (55.1)	78 (100)		
	Upper (I)	1 (50)	1 (50)	2 (100)		
G	Upper Middle (II)	39 (26.5)	108 (73.5)	147 (100)		
Socio-economic status	Lower Middle (III)	19 (24.7)	58 (75.3)	77 (100)	0.936	
	Upper lower (IV)	23 (25)	69 (75)	92 (100)		
	Lower (V)	2 (100)	0 (0)	2 (100)	_	

Figures in parentheses indicate percentage.

Table 6: Dietary history and overweight/obesity.

Dietary history		Overweight/Obese			p-value
		BMI ≥ 23	BMI < 22.99	Total	
	Veg	11 (25)	33 (75)	44 (100)	_
Diet	Non veg	6 (19.4)	25 (80.6)	31 (100)	0.622
	Mixed	67 (27.3)	178 (72.7)	245 (100)	
	Excess	35 (63.6)	20 (36.4)	55 (100)	
Calories	Deficit	29 (16.4)	148 (83.6)	177 (100)	< 0.001
	Appropriate	20 (22.7)	68 (77.3)	88 (100)	
Salads and	< 3times/week	64 (22)	227 (78)	291 (100)	<0.001
Fruits	> 3times/week	20 (31.1)	9 (68.9)	29 (100)	<0.001
Crysota	< 3times/week	79 (26.1)	224 (73.9)	303 (100)	0.983
Sweets	> 3times/week	5 (29.4)	12 (70.6)	17 (100)	0.983
Fast foods	< 3times/week	75 (27.1)	202 (72.9)	277 (100)	0.505
	> 3times/week	9 (20.9)	34 (79.1)	43 (100)	0.303

Figures in parentheses indicate percentage.

33.3% adults who view TV while eating were overweight/ obese and the association was found to be insignificant (Table 7). It is observed from table no.8 that, 65% of inactive and 25% of minimally active were overweight/obese. And out of 56 adults who were doing

Health Enhancing Physical Activity-(HEPA), only 17.9% were overweight/ obese. It shows that physical inactivity leads to obesity. The study result shows that the association between physical activity and obesity is very highly significant (p < 0.001).

Table 7: Watching TV while having food and overweight/ obesity.

Watching TV while Eating	Overweight/Obese BMI ≥23	Non obese BMI <22.99	Total	p-value
Yes	32 (33.3)	64 (66.7)	96 (100)	
No	52 (23.2)	172 (76.8)	224 (100)	0.059
Total	84 (26.2)	236 (73.8)	320 (100)	0.039

Table 8: Physical activity and overweight/obesity.

Physical Activity	Overweight/Obese	Non obese	Total	
	BMI ≥23	BMI <22.99	Total	p-value
Inactive	13 (65.0)	7 (35.0)	20 (100)	
Minimal Active	61 (25.0)	183 (75.0)	244 (100)	
HEPA	10 (17.9)	46 (82.1)	56 (100)	<0.001
Total	84 (26.2)	236 (73.8)	320 (100)	<0.001

Figures in parentheses indicate percentage

DISCUSSION

A cross sectional epidemiological study of overweight & obesity and its risk factors among adults was conducted in Adopted urban slum area with the aim to determine the prevalence of overweight & obesity and certain risk factors associated with them.

In the present study, the prevalence of overweight and obesity was 9.7% and 16.6% respectively. The prevalence of overweight was more in males and the prevalence of obesity was more in females. Similarly, in a study by Sen et al, the prevalence of overweight was more in males (23.67%) as compared to females (20.33%) and the prevalence of obesity were observed to be high among females (29.33%) than males (9.67%). Kumar et al found that the prevalence of overweight/ obesity was 37% and among males it was 27.27% and in females it was 44.64%. In and in a study of northern India in urban slum by Misra et al, obesity was more prevalent in females (15.6%) than in males (13.3%).

The prevalence of obesity was more in females as compared to males in the present study as well in other studies. Majority of the females in India are housewives, this may be one of the reason that females are more obese due to lack of physical activity.

It is observed that 26.2% adults were overweight/ obese and it is found that prevalence increases with increasing age and there is statistically significant association between age and overweight/obesity. Similarly, in a cross-sectional analytical study in Jamnagar by Vadera et al, the prevalence was increased with the rise in age. It was highest in the age group of 50–60 years. From the above studies it is seen that there is association between age and development of obesity. It is also found that the development of obesity is more in females than males and there is association between gender and overweight/obesity and Sen et al also found that the

prevalence of obesity was significantly associated with respect to sex. ¹⁸

The prevalence of overweight/obesity was 26.9% among Hindus and 25% in Muslims. In the present study as well as in study conducted by Anuradha et al and Shashidhar et al it was found that there was no significant association between overweight/obesity and religion.⁹

38.9% of illiterates and 25.5% literates were overweight/obese. The study result shows that there is no significant association between education and overweight/obesity. In a study by Sen et al, the prevalence of obesity was significantly associated with educational status of the study population while the association between overweight and education was insignificant. ¹⁸ In our study we found that obesity was more in Illiterate adults compared to literates.

Also overweight/obesity was seen in adults who have sedentary and minimal active work i.e. in housewives, clerk/shop owners, professions/semi-professions. The prevalence of overweight/obese was more in housewives (44.9%). The study result shows highly significant association between occupational status and obesity. Anuradha et al found no significant association between overweight/obesity and occupational status. 9

Majority of overweight or obese adults were from middle class but there was no association between socioeconomic status and development of obesity. And also in a study of Shashidhar et al, there was increasing trend of overweight or obesity with increase of socio economical class although the difference was statistically not significant. Highest proportion of overweight or obesity was found in upper middle class.²²

The prevalence of overweight/obesity was more in adults belonging to nuclear type of family as compared to joint and three generation family. It is seen that there is no significant association between type of family and obesity. Sen et al also found that the differences in the prevalence of overweight and obesity was observed to be statistically insignificant in case of type of family.¹⁸

In the present study, the prevalence of overweight/obese was more in adults who had family history of obesity and the association was significant. Similarly, Shashidhar et al also found that there was significantly more occurrence of overweight or obesity among the women with the family history compared to those not having the family history.²²

It is also found that overweight/obesity was more in adults whose diet was of mixed type adults who consume more calories than recommended. The association was insignificant between type of diet and obesity but the association was found to be significant between calorie intake and obesity. It is also found that the association consuming fruits and salads overweight/obesity was found to be highly significant but there was no association of intake of sweets and fast foods with overweight/obesity. Vadera et al found that the prevalence of overweight was higher among those who consumed more than recommended calories and the difference was found to be statistically significant. Also, Anuradha et al. found no significant association between overweight/obesity and the dietary pattern and also with type of diet. It was observed that overweight/obesity was more prevalent among those who consumed fruits less frequently and the difference was found to be statistically significant, but no significant association was found between vegetable intake and overweight/obesity. ⁹ In a study conducted by Shashidhar et al, there was highly significant association between overweight and eating food while watching television, but in our study the association between watching TV while eating food with the development of obesity was insignificant.

In the present study majority of the adults were either inactive or minimally active. Also, it is seen that out of 56 adults who were doing health enhancing physical activity-(HEPA) only 17.9% were overweight/obese. There is decrease in overweight/obesity with increase in Physical activity and the association was found to be statistically significant association between physical activities with the development of obesity. In a study of Taka et al in a slum of Mumbai, 92.1% of the women never performed any kind of physical exercise other than household activities and the relationship between obesity and the physical exercise was statistically significant. Also, Goyal et al found that low levels of physical activity are associated with higher prevalence of overweight and obesity. Also,

CONCLUSION

The prevalence of obesity was more in females as compared to males. Majority of the females in India are housewives, this may be one of the reason that females are more obese due to lack of physical activity. Obesity can occur at any age and generally increases with age. we found that obesity was more in Illiterate adults compared to literates. This may be due to that literate people are aware about the morbidities associated with obesity. And, the prevalence of overweight/obese was more in adults who had family history of obesity. This may be due to familial tendency i.e. obese parents will have obese children. The association between energy intake and development of obesity is found to be very highly significant, this shows that the low levels of physical activity are associated with higher prevalence of overweight and obesity Thus, the participation in household activities and regular physical exercise could help in lowering the prevalence of overweight and obesity. Therefore, the role of physical activity, games, and sports should be emphasized.

Recommendations

Prevention of obesity is much more desirable than the treatment of the condition once it is established. Prevention should begin early in life, and should be based on development and maintenance of life long healthy eating and physical activity pattern. More attention should be given to strategies aimed at preventing weight gain and obesity, since these are likely to be more cost effective and have greater positive impact on the long term control of body weight. Obesity management programmes should be established within health care and community services to target individuals and subgroups of the population who have developed or are at risk of developing obesity and its co-morbidities. Training of all health care workers involved in management of obese patients should be improved.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. Narahari P, Rao P, Sharma N, Navukkarasu S, Navaneeth A, Prakash M, et al. Predictors of overweight and obesity among medical students. Int J Sci Res Publ. 2014;4(12):1-12.
- 2. WHO: what are the health consequences of being overweight, Factsheet: March 2013 (cited 2015 august 11). Available at: http://www.who.int/features/qa/49/en/ Accessed on 7 March 2017.
- 3. WHO: Obesity and overweight, Factsheet. Jan 2015. (Cited 2015 Oct 10). Available at: http://www.who.int/mediacentre/factsheets/fs311/en/. Accessed on 7 March 2017.
- 4. Gouda J, Prusty R. Overweight and Obesity among Women by Economic Stratum in Urban India. J Health Popul Nutr. 2014;32(1):79-88.
- 5. Drewnowski A, Popkin BM. The Nutrition Transition: New Trends in the Global Diet. Nutrition Reviews. 1997;55(2):258-98.

- 6. Gothankar J. Prevalence of obesity and its associated co-morbidities amongst adults. National J Comm Med. 2011;2(2):221-4.
- 7. Shinde P, Pawar A. Prevalence of Overweight & Obesity in Adult Urban Women. Journal of Evolution of Medical and Dental Sciences. 2013. Available at: http://www.jemds.com/latestarticles.php?at_id=495 Accessed on 17 March 2017.
- 8. Prajapati D. Prevalence of Obesity among Staff of Tertiary Care Hospital and Medical College in Ahmedabad. Int J Multidisciplinary Res and Development. 2015;2(8):21-4.
- 9. Anuradha R, Ravivarman G, Timsi Jain. The Prevalence of Overweight & Obesity among women in an urban slum of Chennai. J Clin Diagnostic Res. 2011;5(5):957-60.
- World Health Organization (WHO). Diet, Nutrition and the Prevention of Chronic Diseases. Report of a joint WHO/FAO expert consultation. Technical Report Series No. 916 Geneva: World Health Organization.2003.
- 11. World Health Organization (WHO). Physical Status: The Use and Interpretation of Anthropometry. Technical Report Series No. 854. Geneva: World Health Organization, 1995.
- 12. Reddy MN, Kumar KC, Jamil K. New World Syndrome (Obesity) in South India. Open Access Scientific Reports. 2012;1(12):10-2.
- 13. Key Indicators for Maharashtra from NFHS-3. Available at: http://www.nfhsindia.org Accessed on 5 March 2017.
- 14. Maheshwaran G. Kuppuswamy's Socio-Economic Status Scale A Revision of Income Parameter For 2014. Int J Recent Trends in Sci Tech. 2014;11(1):1-2.
- 15. International Physical Activity Questionnaire (IPAQ). Available at: http://www.sdp.univ.fvg.it/sites/default/files/IPAQ_English_self-admin_long. pdf and http://www.institutferran.org/ documentos/scoring_short_ipaq_april04.pdf. Accessed on 4 March 2017.
- 16. WHO/IASO/IOTF. The Asian Pacific Prospective: Redefining Obesity and its treatment. Health Communications Australia Pvt Ltd. 2000.

- 17. Aziz N, Kallur S, Nirmalan P. Implications of the Revised Consensus Body Mass Indices for Asian Indians on Clinical Obstetric Practice. J Clin Diagno Res. 2014;8(5):1-3.
- 18. Sen J, Mondal N, Dutta S. Factors affecting overweight and obesity among urban adults: A cross-sectional study: Epidemiol Biostatistics and Public Health. 2013;10(1):1-11.
- Uthakalla K, Kumar K, Kishore, Jena SK, Matta P, Thomas V, et al. Prevalence Study of Overweight/Obesity among Adults (20-60yrs) of Urban Field Practice Area of Osmania Medical College, Hyderabad. Indian J of PH Res Development. 2012;3(3):250-3.
- 20. Misra A, Pandey R, Devi J, Sharma R, Vikram K, Khanna N. High prevalence of diabetes, obesity and dyslipidemia in urban slum population in northern India. Int J Obesity. 2001;25:1722–9.
- Vadera B, Yadav S, Yadav B, Parmar D, Unadkat S. Study on obesity & Influence of dietary factors on the weight status of an adult population in Jamnagar city, Gujarat. Indian J Comm Med. 2010;35(4):482-6.
- 22. Basagoudar S, Chandrashekar R. Study of obesity & its risk factors among women of Reproductive age group. IJCRR. 2013;5(3):23-8.
- 23. Taka T, Tragler A. Prevalence of Obesity and the Factors influencing it among Women in a Slum of Mumbai. IOSR J Dental Med Sci. 2014;13(4):76-9.
- 24. Goyal J, Kumar N, Parmar I, Shah V, Patel B. Determinants of Overweight and Obesity in Affluent Adolescent in Surat City, South Gujarat Region, India. Indian J Comm Med. 2011;36(4):296-300.

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