Research Article

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ASSESSMENT OF SLEEP AND PHYSICAL ACTIVITY IN OBESE: A RETROSPECTIVE STUDY

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ABSTRACT

Aim: To analyze the role of sleep and physical activity in causation of obesity. Methodology: In this study an attempt was made to assess retrospectively the sleep and physical activity patterns of obese in comparison to non obese through a survey. A pre validated questionnaire containing questions on their sleep pattern and nature of physical activity, was given to 110 obese and 110 non obese and the data was analysed. Results: Sleep duration of 7-9 hours and more than 9 hours, the disturbed sleep pattern, late night sleep, not sleeping throughout the night and day sleep werefactors that were foundasrisk factors in causation of obesity. Sleep duration of 5-7 hours and early morning awakening are found as preventive factors of obesity. The habit of regular physical activity, all kinds of physical activities mentioned in the questionnaire, physical activity more than one year and physical activity more than 30 minutes are found as preventive factors of obesity. Discussion and Conclusion: Long sleep duration is associated with greater risk of increase in adiposity. The reason may be reduced energy expenditure in long duration sleep. Late bedtimes and late wake up times are associated with disruption of circadian rhythm. Regular physical activity of moderate intensity according to the capacity of individuals on daily basis can play a preventive role in obesity. Thus it can be concluded that proper sleeping and daily physical activity can prevent the increase of body weight.

Keywords: Ayurveda, Avyayama, Diwaswapna, Lifestyle, Obesity, Physical Activity, Sleep, Vihara.

INTRODUCTION

In recent times human beings are falling prey to various life style disorders, of which the defect in food habits and lifestyle act as a major cause. One among such lifestyle disorders is obesity. Worldwide the prevalence of obesity has tripled since 1975. In 2016, more than 1.9 billion adults aged 18 and older were overweight of which over 650 million were obese. This represents about 39% of adults with overweight and 13% of them obese[1]. Considering the disease burden in India, according to the National Family Health Survey 2007 it was estimated that 12.1 % of males and 16 % of females were overweight or obese and in Karnataka it was 14 % of males and 17.3 % of females[2].

Obesity is a medical condition in which excess body fat gets accumulated in the body to such an extent that it has a negative effect on health. Obesity is most commonly caused by a combination of excessive food intake, lack of physical activity, and genetic susceptibility[3]. A few cases are also caused by endocrine disorders, medications, or mental illness[4]. The peculiarity of etiological factors and chronic nature of this condition makes the food, lifestyle and medicine equally important in the management of obesity. This condition can lead to the association of many other diseases in its course. Obesity increases the likelihood of various other diseases like heart disease, type 2 diabetes, obstructive sleep apnoea, certain types of cancer, and osteoarthritis[5]. Hence, it is of high significance from the medical point of view when considering the global disease burden.

In Ayurveda there is elaborate explanation of the condition of obesity which is termed as Atisthoulya. It is enumerated as one among the eight types of Ninditapurusha (condemned body types)[6]. Like majority of diseases, the cause for Atisthoulya is also improper Ahara and Vihara both of which are equality important in causation of the condition. When the aspect of aetiology is concerned, commonly only the Ahara part is taken into consideration; but it is to be noted that Vihara also plays a prominent role. Many Vihara have been directly enumerated as the cause for Sthoulya in the classics. Some of them are Avyayama (Lack of physical exercise), Avyavaya (Lack of sexual involvement), Divaswapna (Day sleep), Asana Sukha (Luxurious sitting), Swapnaatiprasanga (Excessive sleep), BhojanottaraNidra (Sleeping after meal) etc. Here through a survey study, an attempt has been made to see the relation between different Vihara and obesity.

MATERIALS AND METHODS

Study design: Design adopted in this study was Retrospective cross-sectional case control observational study.

Source of data: Subjects visiting OPD & IPD of Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan.Ethicalclearance for the study have been obtained from Institutional ethics committee of SDM College of Ayurveda and Hospital, Hassan (SDM/IEC/40/2015-2016). The study is also registered in Clinical trials registry of India (CTRI/2017/10/010094)

Diagnostic criteria

- BMI-30 or more than 30kg/m^2
- Or waist circumference >90 (in males), >80 (in females)
- Or Waist-Hip ratio>0.90 (in males), >0.85 (in females)

Inclusion Criteria

- Adults aged between 18-60 years
- Gender-both male and female
- Those are ready to take part in study and give written consent.

Exclusion Criteria
- Obesity due to secondary causes
- Severely ill patients
- Subjects with Mental illness

Sample size: 220, where 110 subjects were in case group and 110 subjects in control group.

Collection of Data: A pre-validated questionnaire was given to both the groups and their lifestyle practices were recorded. It was then analysed with suitable statistical method.

OBSERVATION AND RESULTS

It was observed that more than 85 % of the subjects in the control group were aged less than 30 years, whereas cases where found to be more spread out. There 50% were below 30yrs, 25.5 below 42 yrs and 13.6 % below 47 years.

Majority of the subjects were having sedentary lifestyle in case group (67.3%) and majority of the subjects in control group were having active lifestyle (78.2 %). In case group 31.8% and in control group 20.9% of subjects had moderately sedentary lifestyle.

In the questionnaire seven different questions dealt with different aspects of sleeping and exercising habits. After analysing the responses the following observations were made. Looking at the sleeping habits it was observed that people who slept for more than nine hours a day were more in the case group (30%) as compared to the control group (9%). Majority of the subjects in the control group (76.4%) slept for 5 – 7 hours daily.

Considering their sleep pattern, 18.8 % subjects in the case group had disturbed sleep always whereas only 6.4 % of control group subjects had this daily. Supportive to this it was noted again that 50 % of subjects in control group never or rarely had disturbed sleep as opposed to 32.8 % of subjects giving the same response in the case group.

It was also noted that the number people who woke up early in the morning more frequently were higher in the control group (57.3%) than in the case group (40%). Correspondingly the number of people who slept late at night more frequently was higher in case group (45.5%) as compared to control group (37.3%).

Sleeping during day time is another aspect that was enquired. Here it was observed that in summer season 21.8 % cases and 9.1 % control subjects; in winter 19.1 % cases and 6.4 % control subjects and in monsoon season 18.2% cases and 0.9% control subjectsdid day-sleep.

The number of people who did one or the other kind of physical activity was more in the control group (83.6%) as compared to case group (51.8%).

Table 1: Different type of physical activity done by the subjects in both groups

Types of activity	Case	Control
Walking	40 %	43 %
Brisk walking	15.3 %	20 %
Exercise	26.1 %	30 %
Yoga	23 %	32 %
Sports	10.7 %	29 %
Gym	16.9 %	30 %

While enquiring about how long the subjects had the habit of daily physical activity, the following responses were noted:

Table 2: Duration of physical activity

Since	Case	Control
Since 1 year	41.5 %	12 %
2 to 5 years	21.5 %	33 %
5 to 10 years	12.3 %	26 %
10 to 15 years	6.1%	10 %

The duration for which each session of activity lasted were also noted. The responses were as shown in Table 3.

Table 3: Duration of physical activity done per day

Duration	Case	Control
15 – 30 min	49.2 %	24 %
30 – 60 min	27.6 %	47 %
60 – 90 min	9.2 %	14 %
Till getting tired	16.9 %	27 %

Chi-square & Cramer's V Coefficient

[P > 0.05 - Not significant (NS), P < 0.05 - Significant (S), P < 0.001 -Significant (HS)] [V> 0.5 - High association (HA), 0.3 – 0.5 - Moderate association (MA), 0.1 – 0.3 - Low association (LA)]

Table 4: Interpretation after applying Chi-Square Test and Cramer's V Coefficient

Sl No	Factor vihara	Vvalue	Association	P value	Significance#
1.	sleep duration 5-7 hours	.325	**MA**	.000	**S**
2.	sleep duration more than 9 hours	.264	**LA**	.000	**S**
3.	I wake up early morning	.286	**LA**	.001	**S**
4.	I do day sleep in summer	.222	LA	.029	S
5.	I do day sleep in winter	.260	LA	.005	S
6.	I do day sleep in monsoon	.357	**MA**	.000	**S**
7.	I have physical activity	.340	**MA**	.000	**S**
8.	I do exercise since one year	.340	**MA**	.000	**S**
9.	I do exercise since 5-10 years	.165	LA	.034	S
10.	I do exercise for 15-30 min	.260	**LA**	.001	**S**
11.	I do exercise for 30-60 min	.193	LA	.013	S

(LA- Low Association, MA-Moderate Association, HA- High Association, S-significant)

Odd's Ratio and Relative Risk

The values of Odd's ratio tell the odds of a person being obese if they are exposed to that specific factor and relative risk shows how much is the risk of becoming obese on exposure to the factor. Statistically if the value is more than 1 then it may be a risk factor and if it is below 1 then it may act as a protective factor. The greater the value the higher the risk and lower the value more is its protective action.

Table 5: Odd's ratio and relative risk

Sl . No	Item	OR	RR
1.	Sleep Duration 5-7 Hours	0.249	0.525
2.	Sleep Duration 7-9 Hours	1.256	1.119
3.	Sleep Duration More Than 9 Hours	4.286	1.764
4.	Sleep Pattern Is Disturbed	1.423	1.198
5.	Will Not Get Sleep At All Throughout Night	1.965	1.359
6.	I Wake Up Early Morning	0.463	0.702
7.	I Do Day Sleep In Summer Season	2.422	1.489
8.	I Do Day Sleep In Winter Season	2.576	1.540
9.	I Do Day Sleep In Monsoon Season	4.974	1.906
10.	I Have Physical Activity	0.218	0.521
11.	I Have The Practice Of Walking	0.425	0.657
12.	I Have The Practice Of Brisk walking	0.586	0.760
13.	I Have The Practice Of Running	0.470	0.665
14.	I Have The Practice Of Exercise	0.497	0.704
15.	I Have The Practice Of Yoga	0.339	0.567
16.	I Have The Practice Of Sports	0.298	0.521
17.	I Have The Practice Of Gym	0.567	0.738
18.	I Do Exercise Since Within 1 Year	5.211	2.296
19.	I Do Exercise Since 2-5 Years	0.557	0.689
20.	I Do Exercise Since 5-10 Years	0.399	0.541
21.	I Do Exercise Since 10-15 Years	0.590	0.707
22.	I Do Exercise For 15-30 Minutes	3.071	1.887
23.	I Do Exercise For 30-60 Minutes	0.432	0.589
24.	I Do Exercise For 60-90 Minutes	0.625	0.737
25.	I Stop When I Am Tired	0.551	0.681

(OR- Odd's ratio, RR-Relative risk)

DISCUSSION

In the observations it was seen that the number of Non Obese subjects were more in the age group 18 – 23 which may be indicative of the fact that as the age progressed the chances of getting obese also increased. But it is not always just related to age since the number of obese in the same age group is also higher compared to other age groups; reflecting the cases of obesity in a younger age. According to a study conducted in the United Kingdom on the prevalence of obesity in young adults in developing countries, the obesity prevalence ranged from 2.3 – 12 % and that of overweight was 28.8 % that too mostly affecting females[7]. Young adults between the age of 18 -25 are in a period of transition from adolescence to adulthood. This is the time when they mostly have drastic changes in their lifestyle as they go out for study or work or get married. The interaction of different social, psychological and biological factors during this period may lead to exposure to risk factors of many disease of which obesity is one of them. This is in parallel to the mithyaharavihara concept of Ayurveda. The common increasing trend of obesity

with increase in age may be associated with the progressively reducing basal metabolic rate, increased sedentary life style and hormonal variation mostly in case of female. Aging is associated with a decrease in growth hormone secretion, reduced responsiveness to thyroid hormone, decline in serum testosterone and resistance to leptin[8]. This resistance to leptin could cause a decreased ability to regulate appetite downwards[9]. The changes with age in the sex hormone levels are associated with changes in body fat distribution. Some studies suggest the weight loss in old age (above 70 years) may be due to ill health.

Sleep is recognized as an important contributing factor to physical and mental health in humans. Healthy sleep requires adequate duration, good quality, appropriate timing and regularity, and the absence of sleep disturbances or disorders[10]. Sleep (Nidra) is one among the three sub- pillars of life[11]. It is as important as food (Ahara) for the sustenance of life. It is also said to be a factor that specially influence the person being obese or lean. The results of the present study are somewhat concordant with the few studies published on the association between sleep duration and the

metabolic syndrome. The subjects who slept for more than nine hours were more in obese group as compared to non obese. The odds of people who slept more than 9 hours being obese was noted to be 4.286 (OR) times more than who did not and the relative risk of such people suffering from obesity was 1.764 times more. Both short and long sleep durations were related to an increased risk of the metabolic syndrome[12]. Long sleep duration was found to be associated with greater increases in adiposity is in line with some epidemiologic data[13]. In this regard, one plausible explanation is that long-duration sleepers are characterized by reduced energy expenditure due to increased time in bed[14]. Another possibility pertains to the fact that obesity is associated with increased proinflammatory cytokines, which promote sleep[15]. In this study it was found that those who slept late at night are more in obese group as compared to non obese group. Beyond sleep duration, sleep timing patterns may contribute to obesity risk. Even in the results the odds of people sleeping late at night being obese was seen to be 1.775 (OR) times more than who sleep at proper time and they had a relative risk of getting obese 1.355 times more than others. Late bedtimes and late wake up times are associated with an unfavourable activity and weight status profile, independent of age, sex, household income, geographical remoteness, and sleep duration[16]. Hypothalamic-pituitary functions, including those that influence eating, energy balance, and metabolism, are strongly tied to circadian rhythms and are highly integrated with sleep regulatory processes. Disruption of the circadian clock can have important metabolic effects. Knock out of the Clock gene, an integral component of the circadian clock, in mouse models leads to obesity and metabolic dysfunction[17]. Ultimately, in order to cause weight gain, reduced sleep must increase caloric intake and/or reduce energy expenditure. Short-term sleep restriction lowers levels of the satiety-promoting hormone, leptin, increases levels of the appetite-promoting hormone, ghrelin, and increases subjective ratings on appetite and hunger[18]. Ayurveda allows day sleep only during summer season due to increased status of vata within the body, as it is said as snigdha[19]. But divaswapna (day sleep) is contraindicated during other seasons except in some diseased conditions and in conditions like ratrijagran(night awakening). Sleeping during day time causes increase in kapha and pitta[20]. In the study it was found that subjects who slept during day time in all seasons and due to night shift were more in obese group as compared to non obese group. It was also found that the odds that the people who slept during day in rainy season being obese was 4.974 (OR) times more than who did not and the relative risk of them suffering from obesity was 1.906 (RR) times more than others.

The majority of the subjects who had physical activity were in non obese group as compared to obese. Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure[21]. The energy expenditure can be measured in kilocalories. Obesity is a complex mal-relationship between energy intake and expenditure that results in such a homeostasis that is resistant to change[22]. Inactivity and obesity are closely linked conditions accounting for a large burden of chronic disease and impaired function, indeed the popular press has called inactivity the "new cancer"[23]. In Ayurveda the vyayama (physical exercise) is explained as one among the daily routines. Its benefits are enumerated as lightness of body, increased ability to do work, improved digestion, reduction of fat and attainment of a well built strong body[24]. Avyayama is also one among causative factors enumerated for atistholya[25]. Mirroring these concepts, it was seen in the results that most types of physical activities had a preventive effect. The odds that a person having any physical activity being obese was 0.218 (OR) times than who did not and they had a relative risk of developing obesity only 0.521 (RR) times. In this study, the subjects those who involved in doing exercise since/within a year were more in obese group whereas subjects those who were

practicing it since 5-10 years were more in non obese group. It shows the subjects in obese group started exercise after gaining weight but in contrary subjects in non obese group practiced it as a Part of their daily routine. The physical exercise only has effect when done regularly for an extended period of time. In the study it was found that the subjects who involved in exercise for 15-30 minutes were more in obese group whereas subjects those involved in exercise for 30-60 minutes were more in non-obese group. The duration of exercise sessions should ideally be 20 to 60 minutes[26]. Recently revised guidelines stress the dose effect of physical activity and emphasize greater weight loss and prevention of regain at the level of 250–300 minutes per week[27]. The best long-term results may be achieved when physical activity produces an energy expenditure of at least 2,500 kcal/week. According to a few studies a minimum of 60 min, but most likely 80-90 min of moderate-intensity physical activity per day may be needed to avoid or limit weight regain in formerly overweight or obese individuals[28].

CONCLUSION

Proper sleep including duration and pattern plays an important role in maintaining the health and in prevention of many diseases like obesity. Less or excessive sleeping and day sleeping may lead to weight gain or obesity. Regular exercise for proper duration has a significant role in preventing obesity.

REFERENCES

1. World Health Organization [Internet]. [cited 2 September 2018]. Available from: http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.
2. Medpulse [Internet]. [cited 2 September 2018]. Available from: http://www.medpulse.in/Community Medicine/ Article/Volume7Issue1/CM_7_1_2.pdf.
3. Wikipedia [Internet]. [cited 2 September 2018]. Available from: https://en.wikipedia.org/wiki/Obesity.
4. Bleich S, Cutler D, Murray C, Adams A. Why is the developed world obese? Annu Rev Public Health (Research Support). 2008; 29:273-95.
5. Haslam DW, James WP. "Obesity". Lancet (Review). 2005; 366(9492):1197-209.
6. Charaka Samhita by Agnivesha, Charaka-Drudabalapratisamskrita with Ayurveda Dipika Commentary of Chakrapani, Edited by Vaidya Jadavji Trikamji. 9th ed. Varanasi. Chaukhamba Prakashan; 2011. p.117.
7. Poobalan AS, Aucott LS, Clarke A, Smith WC. Physical activity attitudes, intentions and behaviour among 18-25 year olds: A mixed method study. BMC Public Health. 2012 Dec; 12(1):640.
8. Samaraa I, Bourb A, Samara I. The prevalence of metabolic syndrome compared to physical activity in a population of sale, a north west city of morocco, The Swedish Journal of Scientific Research. 2016; 3(2).
9. Villareal DT, Apovian CM, Kushner RF, Klein S. Obesity in older adults: technical review and position statement of the American Society for Nutrition and NAASO, The Obesity Society. Obesity. 2005 Nov 1; 13(11):1849-63.
10. Gruber R, Carrey N, Weiss SK, Frappier JY, Rourke L, Brouillette RT, Wise MS, Position statement on paediatric sleep for psychiatrists. Journal of Canadian Academy of Child and Adolescent Psychiatry. 2014; 23(3):174-95.
11. Charaka. Charaka Samhita (Ayurveda Dipika Commentary of Chakrapanidatta) Sutrasthana Ashtouninditiyaadhyaya 21/51. Jadavaji Trikamji Acharya, editor. Varanasi: Chaukhambha Orientalia; 2013. p.119.
12. Hall MH, Muldoon MF, Jennings JR, Buysse DJ, Flory JD, Manuck SB. Self-reported sleep duration is associated with the metabolic syndrome in midlife adults. Sleep. 2008 May 1; 31(5):635-43.

13. Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. PLoS medicine. 2004 Dec 7; 1(3):e62.

14. Chaput JP, Després JP, Bouchard C, Tremblay A. The association between sleep duration and weight gain in adults: a 6-year prospective study from the Quebec Family Study. Sleep. 2008 Apr 1;31(4):517-23.

15. Chaput JP, Després JP, Bouchard C, Tremblay A. The association between sleep duration and weight gain in adults: a 6-year prospective study from the Quebec Family Study. Sleep. 2008 Apr 1; 31(4):517-23.

16. Olds TS, Maher CA, Matricciani L. Sleep duration or bedtime? Exploring the relationship between sleep habits and weight status and activity patterns. Sleep. 2011 Oct 1; 34(10):1299-307.

17. Turek FW, Joshu C, Kohsaka A, Lin E, Ivanova G, McDearmon E, Laposky A, Losee-Olson S, Easton A, Jensen DR, Eckel RH. Obesity and metabolic syndrome in circadian Clock mutant mice. Science. 2005 May 13; 308(5724):1043-5.

18. Spiegel K, Tasali E, Penev P, Van Cauter E. Brief communication: sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite. Annals of internal medicine. 2004 Dec 7; 141(11):846-50.

19. Charaka. Charaka Samhita (Ayurveda Dipika Commentary of Chakrapanidatta) Sutrasthana Tasyashitiyaadhyaya 6/30. Jadavaji Trikamji Acharya, editor. Varanasi: Chaukhambha Orientalia; 2013. p.47.

20. Charaka. Charaka Samhita (Ayurveda Dipika Commentary of Chakrapanidatta) Sutrasthana Ashtouninditiyaadhyaya 21/44. Jadavaji Trikamji Acharya, editor. Varanasi: Chaukhambha Orientalia; 2013. p.118.

21. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public health reports. 1985 Mar; 100(2):126.

22. McQueen MA. Exercise aspects of obesity treatment. The Ochsner Journal. 2009 Sep; 9(3):140-3.

23. DiPietro L, Dziura J, Yeckel CW, Neufer PD. Exercise and improved insulin sensitivity in older women: evidence of the enduring benefits of higher intensity training. Journal of applied physiology. 2006 Jan; 100(1):142-9

24. Vagbhata. Astangahrdaya (Sarvangasundara of Arunadatta & Ayurveda rasayana of Hemadri). Sutrasthana Dinacharyaadhyaya 2/10 ; annotated by Kunte A M &Navre K C, edited by Paradakara H S S, Varanasi: Choukambha Sanskrit Sansthan; 2011. p.27.

25. Charaka. Charaka Samhita (Ayurveda Dipika Commentary of Chakrapanidatta) Sutrasthana Ashtouninditiyaadhyaya 21/4. Jadavaji Trikamji Acharya, editor. Varanasi: Chaukhambha Orientalia; 2013. p.116.

26. McQueen MA. Exercise aspects of obesity treatment. The Ochsner Journal. 2009 Sep; 9(3):140-3.

27. Donnelly JE et al, American College of Sports Medicine. MedSci Sports Exerc. 2009 Feb; 41(2):459-71.

28. Lakka TA, Bouchard C. Physical Activity, Obesity and cardiovascular diseases. In Atherosclerosis: Diet and Drugs. 2005; p.137-163.

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