Original Research Article

A STUDY ON EFFECT OF SLEEP PATTERNS ON BODY FAT MASS OF SCHOOL GOING CHILDREN (8-10- YEARS OLD) IN MUMBAI CITY.

ABSTRACT

Aims: To study the effect of sleep patterns on body fat mass of school going children (8-10-year-old) in Mumbai city.

Study design: Body fat mass was analyzed using Inbody 120 body composition analyzer. Total 388 subjects were selected for the study.

Place and Duration of Study: The period required to carry out study was from November 2018 to March 2019. 388 subjects (male and female) participated from public to private schools in Mumbai city for the study.

Methodology: Total 388 subjects (male and female) participated from 5 schools ranging from public to private school were selected from Mumbai city, (Maharashtra, India). Inbody 120 body composition analyzer was used to assess body fat for the subjects. SPSS version 20 was used for data analysis.

Results: A positive correlation was observed between wakeup timings and body fat mass at $p \leq 0.05$ (0.00). However, the habit of snoring showed highly significant difference at $p \leq 0.05$ for body fat mass (0.00) and fat free mass (0.00).

Conclusion: It was concluded that sleep patterns had a significant impact on body fat mass. Therefore, the sleep timings and wakeup timings need to be observed for the children in their growing age as it may have deep impact on child's body type.

Keywords- body fat mass; sleep patterns; body composition;

1. INTRODUCTION

Sleep is important for child's growth and development. Everyday 9-12 hours of sleep is necessary children ageing 6-12 years. Bed time routine is need of the hour for children. Usage of mobile phones, watching television, playing games on computer showed bad impact on sleep quality.

Sleep timing patterns might contribute to obesity risk. Variable and shifted sleep schedules and evening chronotypes have recently been linked to adiposity in adults; less is known about children. Further, there is little understanding regarding the mechanisms of association. The timing of eating, dietary intake, obesogenic eating behaviors, and changes in appetite regulating hormones was identified as possible mechanisms for sleep–obesity associations and may be promising avenues for future research. (LeBourgeois, 2015)

A cross sectional study by Ghobadi et al in 2018 had reported that television (tv) viewing was associated with childhood obesity in western countries. Further the relationship between obesity and eating habits were while watching tv among primary-school children in the middle east.

Öztürk and Ayhan conducted a study in 2017. According to them, it was observed that poor sleep quality was significantly associated with obesity. The aim of the study was to examine the association of sleep quality with obesity and specific anthropometric measurements.
According to a study carried out in 2012 by Park et al it was seen that there was an interaction between weekday sleep duration and weekend catch-up sleep in relation to childhood overweight, and this effect of weekend catch-up sleep on being overweight. As per the author it was said that there was independent significance between

2. MATERIAL AND METHODS

This study is a cross sectional longitudinal study carried out as a first phase in year 2018-19.
Mumbai provided an ideal setting to study the effect of sleep patterns on body fat mass of children ageing 8-10 years. Total 388 subjects (male and female) participated from 5 schools ranging from public to private school were selected from Mumbai city, (Maharashtra, India). Children from selected schools, falling under the age 8-10 years (Girls and boys) year from 3rd grade were selected by random, purposive sampling.
Inbody 120 machine was used for collecting the body composition data. Body composition analysis gave basic information of the subject's physical status and gives accurate results. The machine analyses different parameters like weight, BMI, total body water, total protein, total fat percentage, total body fat, visceral fat levels, and lean muscle mass and skeletal muscle mass. The children were guided to stand on the inbody120 machine, and the results sheet of the subject was recorded. Inbody 120 machine was used for collecting the body composition data. Body composition analysis gave basic information of the subject's physical status and gives accurate results. The machine analyses different parameters like weight, BMI, total body water, total protein, total fat percentage, total body fat, visceral fat levels, and lean muscle mass and skeletal muscle mass. The children were guided to stand on the inbody120 machine, and the results sheet of the subject was recorded. Body fat mass values were then used for the study.

3. RESULTS AND DISCUSSION

The data was analyzed using SPPS version 20. The method used for analysis was ANOVA. The significance (using f test) for each parameter is mentioned for all the codes all together in the significance column showing the outcome of the parameters.

Table 3.1 Effect of body fat mass on tv timings.

TV timings	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
0(don't watch tv)	73	5.69±2.97	
1(watch tv between 9-10pm)	133	5.91±3.47	0.67
2(watch tv between 10-11pm)	133	5.67±3.73	
3(watch tv between 11-12pm)	46	5.17±3.43	
4(watch tv between 12-1am)	5	4.36±2.16	
TOTAL	388	5.68±3.45	

Body fat mass with tv timings when compared showed the higher mean value of 5.91±3.47 for the subjects who watched tv between 9-10 pm, followed by who did not watch tv post 9 pm showed mean value of 5.69±2.97. The similar trend was observed who watched tv till 11 pm. However, watching tv till 12 am showed mean value of 5.17±3.43 in correlation to body fat mass. Minimal subjects were found watching tv post 12 am which was reported with the mean value of 4.36±2.16. Further it showed that there was no significant difference between when tested

statistically at p≤0.05 (0.67).

Table 3.2, Effect of body fat mass on wakeup timings.

Wake up timings	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
1(before 5am)	0		
2(subjects wake up between 5-6am)	34	7.80±4.18	
3(subjects wake up between 6-7am)	140	6.89±3.48	0.00
4(subjects wake up between 7-8am)	58	4.15±2.45	
5(subjects wake up between 8-9am)	101	4.82±2.99	
6(subjects wake up between 9-10am)	54	4.54±2.95	
7(subjects wake up after 10am)	1	1.90±0	
TOTAL	388	5.68±3.45	

When body fat mass was compared to wakeup timings of subjects the higher mean value who woke up between 5-6am (7.80±4.18). Followed by the subjects who woke up between 6-7am (6.89±3.48). Similar trends were observed between 8-9am (4.82±2.99), 9-10am (4.54±2.95) and 7-8am (4.15±2.45). Lowest mean value was observed for the subjects who woke up after 10am (1.90±0). However, it showed positive correlation between body fat mass and wake up timings p≤0.05 (0.00).

Table 3.3, Effect of body fat mass on sleep timings

Sleep timings at night	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
1(subjects sleep before 7 pm)	0		
2(subjects sleep between 7-8pm)	1	4.00±0	0.05
3(subjects sleep between 8-9pm)	14	5.46±2.80	
4(subjects sleep between 9-10pm)	68	6.72±3.60	
5(subjects sleep between 10-11pm)	145	5.84±3.40	
6(subjects sleep 11-12am)	133	5.22±3.57	
7(subjects sleep between after 12am)	27	4.62±2.44	
TOTAL	388	5.68±3.45	

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The correlation between body fat mass and bed timings did not show any significant effect p≤0.05 (0.38). The subjects who slept between 9-10 pm had higher mean value of 6.72±3.60. When compared with duration between 10-11pm the mean value for body fat mass was observed to be (5.84±3.40). The mean value for the subjects who slept by 8-9 pm was found as 5.46±2.80. The subjects who slept between 10-11pm showed mean value of 5.22±3.57 than subjects who slept post 12am had lesser mean value of 4.62±2.44. However, the lowest mean value was reported for the subjects who slept between 7-8 pm.

Table 3.4 Effect of body fat mass on number of times subject wakeup during night.

Wake up during night	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
0(almost never)	282	5.57±3.38	0.39
1(wake up 2-3times a month)	35	5.42±3.91	
2(wake up 2-3times a week)	27	6.07±3.55	
3(wake up almost every night)	44	6.48±3.50	
TOTAL	388	5.68±3.45	

Body fat mass when compared showed higher mean value for the subjects who woke up almost every night (6.48±3.50), followed by 2-3 times per week 6.07±3.55. A parallel trend was observed for the subjects who woke up never in between sleep (5.57±3.38) and 2-3 times per week (5.42±3.91). This correlation didn't show significant difference at p≤0.05 (0.39).

Table 3.5 Effect of body fat mass on reasons of waking up during night.

Various reasons of waking up during night	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
0(don't wake up)	22	5.49±3.25	0.93
1(there is noise)	47	5.29±3.07	
2(light is on)	11	5.24±4.18	
3(dreams)	26	5.36±2.40	
4(urination)	251	5.80±3.64	
5(noise and urination)	31	5.95±3.22	
TOTAL	388	5.68±3.45	

When body fat mass was compared with reasons of waking up during night. A parallel trend was observed for the various reasons with the mean value of 5.95±3.22 for the subjects who woke up due to noise and urge to use washroom, followed by who woke due to urge for washroom usage (5.80±3.64), the subjects who didn't wake up showed mean value of (5.49±3.25), who woke due to dreams (5.36±2.40) respectively. The minimal mean value was observed for the subjects who woke up due to noise (5.29±3.07) and when the light was switched on (5.24±4.18). Body fat mass showed a non-significant difference at p≤0.05 (0.93).

Table 3.6, Effect of body fat mass on habit of snoring.

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Habit of snoring	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
0(never)	338	5.52±3.33	
1(sometimes)	29	7.78±4.45	
2(often))	13	5.74±3.17	0.00
3(all the time)	8	4.80±2.88	
TOTAL	388	5.68±3.45	

Body fat mass showed higher mean value for the subjects who snored sometimes (7.78±4.45). A similar trend was found for the subjects who snored often (5.74±3.17), also who never snored (5.52±3.33). The lowest mean value of (4.80±2.88) observed for the subjects who snored all the time. However, body fat mass in correlation to snoring showed highly significant difference statistically at p≤0.05 (0.00).

Table 3.7 Effect of body fat mass on feeling of freshness in morning.

Feeling of freshness	No of subjects (N)	Body fat mass $\bar{X}\pm\sigma$	Significance
0(never feel fresh)	84	5.07±2.65	
1(1-2/month don't feel fresh)	2	4.50±0.70	0.14
2(1-2/week don't feel fresh)	16	4.21±1.72	
3(3-5/week don't feel fresh)	90	5.76±4.09	
4(everyday don't feel fresh)	196	6.02±3.52	
TOTAL	388	5.68±3.45	

When body fat mass was compared with feeling of freshness after waking up the maximum mean value was observed for the subjects who woke up fresh everyday (6.02±3.52). Similar trend was observed for the subjects who woke up woke up fresh 3-5times a week (5.76±4.09) also who never woke up fresh (5.07±2.65). Although a decreasing trend was observed for the subjects who woke up fresh 1-2 times a month (4.50±0.70) followed by who woke up fresh 1-2 times a week (4.21±1.72). A non- significant difference at p≤0.05 (0.14) was observed for the subjects who woke up feeling fresh in correlation to body fat mass.

Bhatia et al in 2015 carried out a study. According to the study DEXA scanning to study the relationship between obesity and sleep related breathing disorders and may depend on age and pubertal stage.

4. CONCLUSION-

Questions such as TV timings, watching tv after dinner, wake up and sleep timings were noted, habit of snoring, and feeling of freshness in the morning when they wake up were corelated body fat mass. A positive correlation was observed between wakeup timings and body fat mass at p≤0.05 (0.00). However, the habit of snoring showed highly significant difference at p≤0.05 for body fat mass (0.00) and fat free mass (0.00). It was concluded that sleep patterns had a significant impact on body fat mass. Therefore, the sleep timings and wakeup timings need to be observed for the children in their growing age as it may have deep impact on child's body type.

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AUTHORS CONTRIBUTION

Author[1] Nehal Satra (MSc Clinical Nutrition and Dietetics student)

Author[2] Dr Rupali Sengupta (PHD) (HOD of MSc Clinical Nutrition and Dietetics, Dr BMN College of Home Science)

Author[1] carried out the research, designed the study carried out analysis interpretation of statistical analysis and wrote this manuscript. Author[2] guided throughout the study and helped in analysis of data.

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Consent

INFORMED ASSENT FORM
PROJECT: DEVELOPMENT OF A REPLICABLE SUSTAINABLE MODULE FOR ENSURING GOOD NUTRITIONAL STATUS OF SCHOOL CHILDREN IN MUMBAI CITY- A LONGITUDINAL STUDY"

Principal Investigators: Dr. Rupali Sengupta and Dr. S. A. Udipi,

Participants Name:

Date of birth:

Subject's Initials:

By signing below, I show that: (subject)	Please initial box
1. I confirm that I have read and understood the Information mentioned in this Information sheet. I have received an explanation of the nature, purpose, duration and foreseeable effects and risk of the study and what I will be expected to do and have had the opportunity to ask questions. All of my questions were answered to my satisfaction.	☐
2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.	☐
3. I understand that the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to thus access. However, I understand that my identity will not be revealed if any information is released to third parties or published.	☐
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).	☐
5. I have had my time to make my decision whether or not to	☐

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take part in this research. I agree to take part in the research study described in this form. I will receive a signed and dated copy of this form for my records.

Statement of person obtaining Informed consent

I, the undersigned, have been fully explained the details of this study as described in this Information sheet and Informed consent form to the subject named above.

Name of the subject: _____ Name of the Witness: _____

Signature of the subject: _____ Signature of the Witness: _____

Date: _____ Date: _____

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DCGI Registration No. - ECR/108/Indt/MH/2013

INTERSYSTEM BIOMEDICA ETHICS COMMITTEE

ISBEC

Ethics • Safety • Human Research

January 12, 2019

ISBEC/NR-2/KM-MND/2019

To,

Dr Rupali Sengupta
Dr. Rupali Sengupta, Coordinator MSc
Clinical Nutrition and Dietetics,
Dr. B M Nanavati College of Home Science,
Matunga

Subject: Approval of project"**Development of a replicable sustainable module for school Children - Phase I: assessment of nutritional status and prevalence ofStunting in 7-8 year old school children in selected schools inMumbai city". PI- Dr. Rupali Sengupta, Co-PI - Dr. Shobha Udipi. Version 1.1**

Dear Dr. Sengupta,

The Inter System Biomedica Ethics Committee met and reviewed your proposal on January 10, 2019.

The following documents were reviewed:

1. Forwarding letter by Principal Investigator
2. Biodata of the Principal Investigator
3. Investigator brochure
4. Project protocol
5. Investigator's undertaking
6. Information sheet for participants
7. Consent form for participants
8. Translated consent form in a regional language
9. Data Collection Tools

C/o Kasturba Health Society, Sthanakwasi Jain Aradhana Dham, 17, Khandubhai Desai Road, Vile Parle (W), Mumbai - 400 056.
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At the meeting held on November 24, 2018, your project was reviewed and discussed by the following members and some suggestions were made.

Member	Affiliations	IEC Designation& Role	Voted/Not Voted
Dr. Kiran Marthak	Director Lambda Therapeutic Research Limited	Chairman- Physician , Clinical Pharmacologist and Pharmaceutical expert	**Voted**
Dr. Deepak Dave	Medical Director, KHS-MRC		**Voted**
Dr. Jayashree Joshi	Joint research Director, KHS-MRC	Member Secretary, Ob-Gyn	**Voted**
Dr Meena Dave	Consultant, Clinical Pharmacologist	Member, Clinical Pharmacologist	**Voted**
Dr Mrunal Marathe	Consultant, Health Systems Studies	Member, Social Scientist	**Voted**
Dr Pradnya Talawadekar	Lawyer	Member, Legal Expert	**Voted**
Ms. Manisha Naikdalal	Home Maker	Member, Lay Person	**Voted**

Minor suggestions were made by the members and the revised protocol has been approved by the Committee.

The Ethics Committee works as per the guidelines of ICH-GCP, Schedule Y and ICMR.

The Independent Ethics Committee expects to be informed about the progress of the study, any SAE occurring during the course of the study, any changes in the protocol, sites, investigators and participants' information/informed consent and asks to be provided an annual update and a copy of the final report. The approval is valid till January 11th, 2020.

Yours sincerely

Dr. Kiran Marthak

Chairman

Ms. Manisha Naikdalal

Joint Secretary

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