

Interrelation between Reproductive Morbidities and BMI  
in Adolescents Girls of UP, India

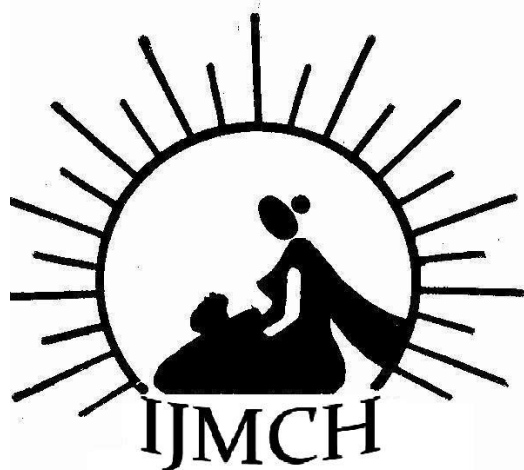
*Sujata Deo*

*Monika Gautam*

*S P Jaiswar*

*P L Shankhwar*

[www.ijmch.org](http://www.ijmch.org)



## INDIAN JOURNAL OF MATERNAL AND CHILD HEALTH

Indian adolescence girls take average nutrient intake which is much below the recommended allowances.

## Interrelation between Reproductive Morbidities and BMI in Adolescents Girls of UP, India

<sup>1</sup>Sujata Deo, <sup>2</sup>Monika Gautam, <sup>3</sup>S P Jaiswar, <sup>4</sup>P L Shankhwar

<sup>1,3,4</sup>Professors, Department of Obstetrics and Gynaecology,  
<sup>2</sup>Ph.D. Scholar, Department of Community Medicine and Public Health  
King George Medical University, Lucknow, Uttar Pradesh, India

*Correspondence: Ms Monika Gautam*

### ABSTRACT

**Background:** Indian adolescence girls take average nutrient intake which is much below the recommended allowances. Underweight and stunted adolescence girls are recognized as an obstetric risk factor, which may be associated with poor concurrent and future reproductive outcomes. **Objective:** To identify the correlation between Body Mass Index and adolescent reproductive problems. **Study design:** Cross-sectional study **Setting:** 1) Schools of rural and urban areas of Lucknow 2) Queen Mary's Hospital, K G Medical University, Lucknow.

**Participants:** 600 adolescent girls. **Result:** Age of onset of menarche was significantly less among underweight and overweight girls, whereas menstrual irregularities was significantly higher among overweight and obese girls. **Conclusion:** Therefore to achieve the optimum health of adolescence, there is a need to introduce a comprehensive adolescent Health initiative in the approach of adolescence.

**Key words:** *Reproductive morbidities, Body Mass Index*

### INTRODUCTION

India is one of the countries who have rapid growth of young population with an estimated 190 million adolescence. According to Census 2011, total population of India is 1,210,193,422 in which 20% (243 million) constitute adolescence. Most of them are out of school and have limited choices for better future. In the present India, girls lost their life in the cycle of early marriage, early pregnancy, repeated pregnancy and less nutritional intake.

The word adolescence is derived from the Latin verb "adolescence", which means, "Grow to maturity". It is a period of transition from childhood to adulthood. Adolescent girls constituting nearly one tenth of Indian population, from a crucial segment of the society. Adolescent possess distinct array of reproductive and sexual health challenges that include anaemia and malnutrition, high risk behaviour, lack of awareness about contraception and reproductive health issues, sexually transmitted infections including HIV/AIDS, complication of unsafe sex, abortion and teenage pregnancy.

Recently various gynaecological problems like amenorrhoea, menorrhagia, oligomenorrhoea, irregular bleeding, dysmenorrhoea, abdominal pain, and vaginal discharge during adolescence occur more perhaps due to obesity, changing life style, increasing stress and environmental factors. Obesity has become a colossal epidemic causing serious public health concern and contributes to 2.6 million deaths worldwide every year. Obesity has

been associated with menstrual dysfunction, reproductive disorders including infertility, increased abortion rates and pregnancy complications and adverse pregnancy outcomes.

BMI is most widely used method to gauge obesity and it is an indicator of underlying health. As WHO (2003), BMI=25-29.9kg/m<sup>2</sup> is considered as overweight category, >30kg/m<sup>2</sup> is obese category, 18.5-24.9 kg/m<sup>2</sup> as normal, <18.5kg/m<sup>2</sup> is considered as underweight category. A study done by Praveen Agarwal et al. India, 2004 it was found that overweight and obesity increases the risk of adverse pregnancy outcomes. Overweight related to early menarche and underweight related to late menarche. Azziz et al., 2004; March 2010 found that Polycystic ovary syndrome in teenagers is characterised by irregular menstrual cycle, generally less than six menses per year, more than 50% of PCOS patients have the metabolic syndrome, including obesity, insulin resistance and dyslipidemia.

A study in India observed that about 20% of adults who were not overweight or obese as per the BMI definition still had abdominal obesity (Gopalan 1998). Lin Su et al. (2002) studied that relationship between BMI and age at menarche on the basis of BMI and standard deviation score (SDS). Average age at menarche was 11.87±1.1 years in the obese group, 12.14±0.9 years in the overweight group, and 12.20±1.3 years in the normal weight group. Pearson correlation factor between BMI, SDS and age at menarche was -0.24 (p<0.01). Their findings suggested an important role of increased body fatness and menarche that extends beyond underweight girls.

**Objective:** To identify the correlation between Body Mass Index (BMI) and adolescent reproductive problems.

#### **MATERIAL AND METHODS**

A cross-sectional study was held in schools of urban and rural areas of Lucknow and in Queen Mary Hospital, Department Of Obstetrics and Gynaecology, King George's Medical University, Lucknow. The study was conducted for a period of one year from August 2011 to July 2012. Total 600 adolescent girls (age group of 10-19 years) were involved in the study in which 226 girls from Queen Mary Hospital, and 374 girls from government and public schools of Lucknow. Study subjects were interviewed by using a structured questionnaire after obtaining subject's and respective institute's informed consent and giving them assurance regarding confidentiality and privacy. The present study was an attempt to explore the association of reproductive health issues and BMI.

Weight, height and waist hip circumferences of the subject were measured through Weighing machine and measuring tape. BMI was calculated by the following formula:

$$\text{Body Mass Index (BMI)} = \text{Weight} / (\text{Height})^2$$

The information gathered by these girls were compiled and then tabulated for statistical analysis which was done by SPSS version 15.0 using frequencies, percentage and chi-square test. The values were represented in numbers (%) and mean±SD. The level of confidence was taken as 0.05, hence a "p" values less than 0.05 indicated a statistically significant association.

**Inclusion criteria:** All girls age group of 10-19 years who gave voluntary consent for participation were recruited irrespective of marital, socio-economic and literacy status.

**Exclusion Criteria:** Girls were suffering from any weight losing disease and using hormonal medication other than oral contraceptives, or who were not willing to participate and complete the questionnaire excluded from the study.

## RESULT

Total 600 girls constituted 38% (228) of 14-16 years of age group, 36% (216) of 10-13 years of age group and 26% (156) of 17-19 years of age group, in this study the mean age of girls was  $14.79 \pm 2.69$  years. 23.2% girls from rural and 76.8% girls from urban area were participated. Maximum of the girls literate and only 10.7% (64) girls were graduate and 3% (18) girls were illiterate. A majority of girls 84.3% (506) were unmarried. Out of 600 girls, 438 (73%) girls had attained menarche at the time of study.

**Table 1: Distribution of girls according to BMI status**

BMI Category (kg/m <sup>2</sup> )	No. of girls	Percentage
Underweight ( $\leq 18.5$ )	130	21.7
Normal Weight (18.5-24.9)	297	49.5
Overweight (25.0-29.9)	142	23.7
Obese ( $\geq 30$ )	31	5.2

Maximum number of girls (49.5%) were in normal weight category. A total of 21.7% were underweight. There were 23.7% girls were overweight and only 5.2% were obese. (Table 1)

**Table 2: Distribution of girls according to Waist Hip Ratio Category**

WHR Category (Waist/Hip Ratio)	No. of girls	Percentage
Underweight ( $< 0.81$ )	105	17.5
Normal weight (0.81-0.87)	326	54.3
Overweight / Obese ( $\geq 0.88$ )	169	28.2

According to Waist Hip Ratio, majority(54.3%) of subjects were in normal weight category. 17.5 % were underweight and 28.2% were overweight/obese. (Table 2)

Maximum number of girls who have attained menarche were of normal weight category (80.5%) followed by overweight category (72.5%). It was observed that the age of onset of *menarche* was significantly less among those who were underweight and overweight, whereas menstrual irregularities was significantly less among those who were normal weight (31.8%). Dysmenorrhoea was common in normal weight category (35.1%), these normal weight category girls were of age group 10-18 years and this was statistically significant ( $p < 0.05$ ). Incidence of menorrhagia was significantly higher in underweight (22.4%) category as compared to overweight (14.6%) and normal weight (4.6%) category ( $p < 0.001$ ) and maximum number of girls have menorrhagia were of 13-18 years. Oligomenorrhoea were more common in overweight girls in age group of 10-15 years ( $p = 0.641$ ). whereas hypomenorrhoea was more common in obese girls in all age groups of 10-18 years ( $p = 0.889$ ). Irregular menstrual cycle was also more common in overweight girls

in age 10-12 years and 16-18 years. Primary amenorrhea commonly found in 16-18 years of girls which was also statistically significant ( $p < 0.001$ ). (Table 3)

Itching and discharge per vagina were the gynaecological complaints reported by a total of 84 (14%) and 140 (23.3%) girls out of 600 respectively.

**DISCUSSION**

This present study was carried out with an objective to explore the association between BMI and adolescent reproductive problems. Total 600 girls of age group 10-19 years were participated in the study and the mean age of girls was  $14.79 \pm 2.69$  years. Patil S N et al. 2009 also found 16.9 years mean age of study subjects. Present study found that out of total 23.2% girls from rural and 76.8% were from urban region, girls who were attending college from 75.67% from urban and 24.33% from rural areas and those who among hospital attending girls, out of 226, 78.76% girls belongs to urban and 21.24% belonged to rural areas. Dr. Arun Mahadeo Kokane et al. 2009 observed in their study that adolescent group of 834 (68.87%) were from rural and 377 (31.13%) were from urban areas. It reveals the truth that there is a need to promote female education and make them more aware about available resources for the promotion of health in rural areas.

**Table 3: Body Weight Category, Age and Menstrual Problems**

Age (yrs)	Underweight			Normal weight			Overweight			Obese			Statistical Significance	
	Total	Irreg	%	Total	Irreg	%	Total	Irreg	%	Total	Irreg	%	$\chi^2$	P
<b>Dysmenorrhea</b>														
10-12	28	6	21.4	56	12	21.4	27	5	18.5	3	0	0.0	0.886	0.829
13-15	28	9	32.1	123	51	41.5	49	12	24.5	4	1	25.0	4.811	0.175
16-18	20	5	25.0	60	21	35.0	27	7	25.9	13	4	3.8	1.112	0.774
$\chi^2$	0.853			6.777			0.488			1.231				
P	0.653			0.034			0.783			0.540				
<b>Menorrhagia</b>														
10-12	28	3	10.7	56	2	3.6	27	4	14.8	3	0	0.0	3.781	0.286
13-15	28	7	25.0	123	7	5.7	49	8	16.3	4	0	0.0	11.245	0.010
16-18	20	7	35.0	60	2	3.3	27	3	11.1	13	1	7.7	15.721	0.001
$\chi^2$	4.139			0.688			0.382			0.567				
P	0.126			0.709			0.826			0.753				
<b>Metrorrhagia</b>														
10-12	28	1	3.6	56	0	0.0	27	0	0.0	3	0	0.0	3.099	0.377
13-15	28	2	7.1	123	2	1.6	49	0	0.0	4	0	0.0	5.043	0.169
16-18	20	0	0.0	60	1	1.7	27	0	0.0	13	0	0.0	1.008	0.799
$\chi^2$	1.586			0.930			-			-				
P	0.452			0.628			-			-				
<b>Polymenorrhea</b>														
10-12	28	1	3.6	56	1	1.8	27	2	7.4	27	2	7.4	1.813	0.831
13-15	28	1	3.6	123	3	2.4	49	0	0.0	49	0	0.0	1.584	0.663
16-18	20	1	5.0	60	2	3.3	27	2	7.4	27	2	7.4	0.879	0.831
$\chi^2$	0.079			0.866			3.776			0.567				
P	0.961			0.289			0.151			0.753				
<b>Oligomenorrhea</b>														

10-12	28	1	3.6	56	1	1.8	27	1	3.7	3	0	0.0	0.455	0.929
13-15	28	0	0.0	123	3	2.4	49	8	16.3	4	1	25.0	16.679	0.001
16-18	20	0	0.0	60	4	6.7	27	6	22.2	13	3	23.1	9.151	0.027
$\chi^2$	1.737			2.779			3.954			0.889				
P	0.420			0.249			0.138			0.641				
<b>Hypomenorrhea</b>														
10-12	28	2	7.1	28	2	7.1	27	2	7.4	3	1	33.3	6.546	0.088
13-15	28	2	7.1	28	2	7.1	49	5	10.2	4	2	50.0	21.415	<0.001
16-18	20	2	10.0	20	2	10.0	27	6	22.2	13	5	38.5	15.068	0.002
$\chi^2$	0.165			0.607			3.182			0.235				
P	0.921			0.738			0.204			0.889				
<b>Primary amenorrhea</b>														
10-12	70	0	0.0	93	0	0.0	48	0	0.0	5	0	0.0	-	-
13-15	33	1	3.0	130	1	0.8	60	0	0.0	5	1	20.0	15.289	0.002
16-18	27	5	18.5	74	13	17.6	34	6	17.6	21	7	33.3	2.773	0.428
$\chi^2$	15.430			36.324			19.900			2.449				
P	<0.001			<0.001			<0.001			0.294				

In the present study maximum girls (49.5%) were in normal weight, 21.7% were underweight, 23.7% girls were from overweight and 5.2% were from obese category. 23.5% overweight girls were attained menarche, whereas 4.6% obese girls and 17.4% underweight girls were attained menarche. A study done by Saha et al. 2008 there were 12.14 % girls were underweight while 11.21% girls were overweight.

In the present study only 2 girls under study had menarche before the age of 10 years. Out of total 49.5% girls had menarche at the age of 11-13 years and 20.5% girls had menarche at the age of 14 years or above. Jogdand et al (2011) found in their study that out of 360 girls 257 (71.39%) girls have attained menarche. Abeer Eswi et al. (2012) found age of menarche from 9-17 years with a mean of  $12.87 \pm 1.29$  years.

In this study dysmenorrhea was found in 30.6% girls, followed by menorrhagia 10.9%, primary amenorrhea 7.8%, hypomenorrhea 7.3%, oligomenorrhea 6.6%, and irregular cycles 3.9% girls. M. Meghachandra Singh, et al. (1999) in their study found that the 44.6% girls suffered from menstrual problems, commonest being dysmenorrhea in 40.7% girls which is almost similar with present study. B.N. Joshi et al. (2006) found in their study that the dysmenorrhea is commonest disorder affecting 50% of menstruating girls.

*Oligomenorrhea and hypomenorrhea was significantly higher in girls who were overweight (14.6% and 12.65 respectively) and obese as compared to those who were normal and underweight. Amenorrhea was significantly associated with obesity ( $p < 0.001$ ),* In this present study 78 cases attending Gynae OPD had amenorrhea, out of which 34(43.6%) had primary and remaining 44 (56.4%) had secondary amenorrhea. Maltha Hickey et al. (2003) in their study found that 60% patients had primary amenorrhea with developmental abnormalities, which is PCOD commonly causes secondary amenorrhea. These results were comparable with the findings of the present study. while pregnancy was more common in normal weight (9.1%) category. Knowledge about contraception (23.8%), HIV/AIDS (13.8%) and STI/RTI (14.6%) was significantly lower in underweight category as compared to other categories.

In the present study (23.3%) girls reported excessive vaginal discharge in gynaecological OPD. It was also observed that 84 girls had itching in genital region in association with

vaginal discharge. Sumati kukarni (2000) in her study on married adolescent show 26.2% females report abnormal vaginal discharge and Majumdar et al. (2000) reported 8.2% for vaginal discharge. B. N. Joshi et al. (2006) in their study on reproductive health problem among adolescent showed that 21.3% (32 out of 150) girls reported vaginal discharge and where as 15 girls (10%), out of these had associated itching.

### **Ethical consideration**

The study has been approved by the Institutional Ethics Committee, Research Cell, King George's Medical University, UP, Lucknow through the their letter no. 22021/R-Cell-11.

### **CONCLUSION**

The study revealed that the reproductive problems were significantly associated with the Body Mass Index. It also indicates that the unhealthy life style and eating behaviour adversely affect nutrition of the adolescent, which causes problems related to menstruation and further results poor reproductive health.

Study suggested that the consumption of high fat and high energy food (Junk food) should be avoided by children because prevention of obesity in children is easier than the adults. Sedentary life style should be discouraged. Physical activity like playing outdoor games, walking, cycling, should be encouraged. Health education should be given to parents, teachers and children regarding dietary habits and life style. To achieve the optimum health and development of the adolescent segment of the population , there is a need to introduce a comprehensive adolescent Health initiative in the approach of adolescence..

### **ACKNOWLEDGEMENT**

The study was supported by the setting of King George's Medical University at every step. It provided the needed facilities and supporting environment.



## REFERENCES

1. World population prospects. The 2004 Revision , New York, United nations,2005.
2. Registrar General and Census Commissioner, 2001 Census of India, 200: Registrar General and Census Commissioner.
3. UNICEF State of World's Children 2011 Adolescence : An age of opportunity, p 1 Available at <http://www.unicef.org/sowc2011/pdfs/India>. and UNICEF : The State of the World's Children 2012.
4. Praveen Agarwal and Vinod Mishra, Covariates of overweight and obesity among women in North India, No. 116, January 2004.
5. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. *J Clin Endocrinol Metab* 2004;89:2745-2749.
6. Saha SK, Bag T, De AK, Basak S, Biswas SC, Ghosh Roy SC. Adolescent girls' health profile in Sub-Himalayan region of West Bengal. *J Obstet Gynecol India* 2006; 56(4):329-332.
7. Gopalan, C. (1998). Obesity in the Indian urban 'middle class'. *Bulletin of the Nutrition Foundation of India* 19 (1), 1-5.
8. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. *J Clin Endocrinol Metab* 2004;89:2745-2749.
9. Lin-Su K, Vogiatzi MG, New MI. Body Mass Index and age at Menarche in an Adolescent Clinic Population. *Clin Pediatr* 2002; 41(7):501-507.
10. B. N. Joshi, S.L. Chauhan, U.M. Dondel, V.H. Tryambake, N.S. Gaikwad, V. Bhadoria. Reproductive Health Problems and Help Seeking Behaviour Among Adolescents In Urban India. *Indian Journal of Paediatrics*, 2006;73:509-513
11. Dr Arun Mahadev Kokane *et al* 2009, a cross sectional study of adolescent pregnancy and its outcome at rural tertiary care hospital in [India.arun\\_kokane76@yahoo.com](mailto:India.arun_kokane76@yahoo.com)
12. Abeer Eswi, Houaida Helal and Wafaa Elarousy, Menstrual Attitude and Knowledge among Egyptian female Adolescents, *Journal of American Science*, 2012;8(6).
13. M. Meghachandra Singh, Reeta Devi, S.S. Gupta. Awareness and Health Seeking Behaviour of Rural Adolescent School Girls on Menstrual and Reproductive Health Problems. *Indian Journal Of Medical Sciences* 1999.
14. Patil SN, Wasnik V, Wadke R, Health problems amongst Adolescent Girls in Rural Areas of Ratnagiri District of Maharashtra India. *Journal of Clinical and Diagnostic Research* 2009; 3: 1784-1790.
15. Martha Hickey and Adam Balen. Menstrual disorders in adolescence : investigation and management . *European Society Of Human Reproduction And Embryology*. 2003;9(5): 494-504.
16. Majumdar R. And Ganguli S K (2000): A Study of Adolescent Girls in pune;health and Population-Perspectives and issues, *NIHFW*, New Delhi, 23(2): 95-104.
17. Van Hoff MHA, Voorhorst FJ, Kaptein MBM, Hirasing RA, Koppelaar C, Schoemaker J. Relationship of the menstrual cycle pattern in 14-17 years old adolescent with gynaecological age, body mass index and historical parameters. *Human Reproduction* 1998; 13(8): 2252-2260.
18. Park K. Park's Textbook of Preventive and Social Medicine. 19<sup>th</sup> ed. Jabalpur, India: M/s Banarasidas Bhanot Publishers; 2007.