Summary and Conclusions
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Health and nutritional status of adolescent girls, obstetric performance and nutritional factors influencing pregnancy outcome was examined in a prospective study involving subjects from lower socio-economic strata. Two hundred and fifty adolescent girls each from the slums of Bombay and Bangalore constituted the sample for cross sectional study. A sub-sample of 150 pregnant girls formed the subjects for the longitudinal study. They were recruited for the study at 12 to 16 weeks of gestation and were followed up till term for weight gain and pregnancy outcome.

Socio-demographic information as well as previous obstetric performance, dietary status, present anthropometric, dietary and biochemical status were recorded. Pregnancy outcome i.e. birth weight was examined in relation to menarcheal age, gynaecological, age, gestational age, weight gain, anthropometry, dietary and biochemical status.

The results of the study showed

1) Percentage of unmarried girls were comparatively less (24 and 17 for Bombay and Bangalore respectively) in the later teens.

2) Majority of the subjects were semi-literates and their mean per capita income was < Rs. 250/- per month.

3) Mean menarcheal age was 12.5 and 13.5 years for Bombay and Bangalore respectively and correspondingly mean age at marriage was 15.4 and 16.3 years for the two places respectively.
4) Nutritional status of adolescent girls revealed that girls in the age of 19 years were significantly taller and heavier when compared to 17 and 18 year old girls which means the conception must be delayed beyond 20 years of age for satisfactory outcome of pregnancy.

5) Dietary inadequacies observed was to the extent of 26-28% for energy and 16-22% for protein and 70% for iron.

6) Incidence of teenage pregnancy was higher (210 per thousand total deliveries) for Bangalore and (46.4 per thousand total deliveries) for Bombay.

7) Mean gynaecological age for the study population was 3.6 and 4.0 years for Bombay and Bangalore respectively. Higher the gynaecological age of the subject, higher was the mean birth weight. Thus, it is the gynaecological age that is a determining factor for birth weight and not menarcheal age per se.

8) Mean pre-pregnancy weight for the study population was 43.0 Kg. with a mean gestation weight gain of 8.16 Kg. and 8.70 Kg. for primiparous and multiparous subjects. The mean weight gain for the whole population was 8.0 Kg. The average weight gain for the two age groups (< 19 years and > 19 years) was 8.46 and 8.50 Kg. respectively. Weight gain was highly correlated to birth weight and energy intake.

9) Steady increase in average birth weight of infants from 2.32 Kg. to 2.76 Kg. with increase in maternal height from 140 cm. to 160 cms.

10) Statistically significant difference was not observed in birth weight between the two BMI groups (< 1.88 and > 1.88) so also the incidence of low birth weight.
11) A high correlation between gestation and increase in abdominal girth and birth weight.

12) The mean mid arm circumference was 21.55 cms. for the entire population and 21.69 cms. and 21.41 cms. for the two age groups (< 19 years and > 19 years). An increase of 10 cms. in the measurement resulted in an increase in mean birth weight by 410 g.

13) Mean total skinfolds for the entire population ranged from 58.8 mm. for < 16 weeks of gestation to 72.9 mm. for > 37 weeks with a mean fat (% body weight) ranging from 30.25 to 33.75.

14) Fat gain during pregnancy was calculated from prenatal weight gain. Fat gain was significantly influenced by age of the mother during pregnancy, with lower fat gain seen in younger mothers and lower weight gain.

15) Need for increased food intake during lactation has been partially recognised but the importance of a similar increase during pregnancy has not been fully realised.

16) Nearly 46% of the subjects stopped breast feeding because of overlap of next pregnancy.

17) Mean daily energy intake during pregnancy was 1356 and 1433 Calories for age groups < 19 years and > 19 years respectively. Percent adequacy of Calories was to the extent of 60%. Energy consumption showed significant influence on birth weight and statistically significant correlation.

18) Mean daily protein intake was 46 and 40 gms. for the two age groups respectively. Percent adequacy of protein was 57% and 77% for these two age groups. Birth weight of infants whose mother's daily protein intake was
less than 30 g. was significantly lower than those who consumed more than 45 g. per day. No significant difference in birth weight with the protein intake between 30-45 g.

19) Mean daily iron intake was not more than 11 mg. in both the age groups. The adequacy was to the extent of 30%.

20) Statistically significant association was not observed at different levels of iron intake and mean birth weight.

21) Statistically significant difference was not observed between the two age groups, though the mean values for all the biochemical parameters were lower than the normal values. The mean birth weight ranged from 2.58-2.75 Kg. Lower blood values did not significantly affect the pregnancy outcome. The sub-optimal level for poor reproductive performance may be much lower.

22) Mean haemoglobin level was 10.08 and 11.17 g/dl for the two age groups respectively. Younger age group had lower serum iron values, lower haemoglobin levels and also lower birthweight and higher perinatal mortality, when compared to the older age group. Multiparous were more susceptible to severe anaemia than primiparous. Incidence of anaemia increased with increase in gestation.

23) Among the anthropometric measurements: maternal gain in weight, abdominal girth and mid arm circumference; among the dietary components: energy intake and among the biochemical parameters: haemoglobin level were found to influence birth weight, when the effect of all prenatal factors was studied together.
24) Two major factors responsible for increased prevalence of low birth weight babies were maternal age, primiparity, body weight below 40 Kg. and haemoglobin < 11 g/dl.

25) The net pregnancy wastage was 10% in the later adolescence and maximum of 14.5% in the younger mothers. Perinatal mortality was higher (56%) in girls who conceived before the age of 15 years. Pregnancy wastage of 25 to 35% in those cases where the birth spacing was less than 2 years.

26) Prevalence of recurrent abortion and risk of perinatal death was highest when conception had occurred within the first 12 months. The outcome of pregnancy was favourable when the conception was 25 months after last delivery.

27) A small percentage of 13% of the subjects reported use of contraceptives. Oral contraceptives was found to be more popular among the users.

28) Education of the target population of adolescent girls was found to be essential regarding; increased food requirements during pregnancy, misconceptions about foods during pregnancy, postponement of pregnancy to adulthood.
RECOMMENDATIONS FOR FURTHER RESEARCH

In any socio-economically deprived population, a large proportion of women will be victims of undernutrition. The chances of poor pregnancy outcome and low birth weight infants in this population is high. Such infants who have a poor start in life do not reach their maximum growth potential and exhibit poor nutritional status. Thus a vicious cycle is perpetuated in case of female infants if she is further undernourished in her growing years and may remain stunted. Therefore, preventive measures are important to break this vicious cycle in utero as well as postnatally. The following factors may be considered:

1) Increasing the age at marriage and thus ensuring that the girl is gynaecologically mature at the time of first pregnancy and that nutritional needs of the foetus may not super-impose on the nutritional needs of the young mother and compromise her growth.

2) Non formal nutrition education to the adolescent school dropouts emphasizing on the postponement of pregnancy beyond 20 years of age, proper diet during pregnancy and better avail of existing health and nutritional services.

3) More information is needed on the occurrence of teenage pregnancies from certain states where incidence is expected to be high. For eg: in Rajasthan, where "Sati System" is still prevalent. Prevalence of early marriage and pregnancy need to be studied in these places based on which longitudinal study has to be conducted.

4) Little information is available about the earliest age of pregnancy in relation to menarche. There is a need for carefully planned longitudinal studies of large
numbers of girls. It should begin from birth itself considering the discrimination in sex and gender bias in feeding and health care. The study could continue to the end of growth period. Girls from all socio-economic groups should be included.

5) Further research is needed on nutritional requirements in the different stages of adolescent growth and development.

6) Studies are needed to determine effective educational methods for developing eating habits that will promote desirable nutritional status.

7) Better milestones are needed for assessing nutritional status of adolescents.

8) Indepth studies on adaptive mechanisms to explain the discrepancies in nutrient intake and requirements.

9) Further studies on protein nutrition in determining the pregnancy outcome is desirable.

10) Because of the close association between poverty and pre-eclampsia, there is a need for studies to isolate the effects of poverty, including poor nutrition, on the course and outcome of pregnancy.