

IMPACT OF NUTRITION EDUCATION AND MEDICAL SUPERVISION ON PREGNANCY OUTCOME

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ABSTRACT

Sixty Punjabi women from low and lower middle income groups were selected from eight villages of Ludhiana district. The supplements of iron, folic acid and calcium in the form of Folifer and Calcium Sandoz tablets were regularly supplied to experimental (E) group from second trimester onwards. A pamphlet about the diet during pregnancy was distributed to the E group along with four individual and three group contacts during the second half of pregnancy. The control (C) group was provided iron and folate supplements as per Government practice. Body height, weight, mid-upper arm circumference (MUA) and skinfold thickness of the subjects were recorded. Weight gained during pregnancy and post partum weight were also recorded and body mass index was calculated. In addition, crown heel length (CHL), birth weight (BW), skinfold thickness, MUA, head circumference (HC), Chest circumference (CC) and ponderal index (PI) of the neonates were recorded within eight hours of their birth. The gain in weight during pregnancy was 6.30 and 5.7 kg in E and C groups respectively. The study revealed that BW, CHL, skinfold thickness and PI of the newborns were significantly ($p < 0.01$) higher in E group. The mean BW of newborns in E and C groups was 2700 g and 2300 g, respectively. Weight gained during pregnancy had significant ($p < 0.05$) correlation to MUA, BW and skinfold thickness of the newborn.

Key words: Rural pregnant women, Medical supervision, Nutrient supplements.

The growth pattern and the physical state of the pregnant women's body, though genetically determined are profoundly influenced by nutrition. Hence, anthropometric measurements are useful criteria for assessing nutritional status. Maternal nutrition is the most important environmental influence during the development of fetus. Poor nutrition during pregnancy is associated with inadequate weight gain and low birth weight neonates. It is also a well-known fact that good nutrition during pregnancy is reflected by satisfactory weight gain of the mother and has a better impact on fetal growth.

As per the recommendations of Government of India one subsidiary health centre has been provided in all the villages for 5,000 population in Punjab. The staff of SHC is expected to provide medical supervision and Folifer tablets to pregnant women during the last 100 days of pregnancy. This practice, however, has not resulted in a significant improvement in the nutritional status of pregnant women and neonates. Therefore, the major objective of this study was to determine the effect of nutrition education, medical supervision and nutrient supplementation on the anthropometry of rural pregnant women and their neonates.

Material and Methods

The study was undertaken on subjects

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from low and lower middle income groups in eight villages of Ludhiana district. Sixty six pregnant women were equally divided into two groups: experimental (E) and control (C) groups. Nutrient supplements in the form of Folifer (iron and folic acid) and Calcium Sandoz tablets were supplied regularly to the subjects of E group from the fifth month of pregnancy till delivery. On the other hand, some of the subjects of the C group who visited the subsidiary health centre (SHC) consumed only Folifer tablets as these are supplied free of cost. During the first trimester, five subjects, two and three from the E and C groups, respectively aborted and one child died just after the delivery in the E group. So the data of only 60 subjects was taken. The body height, weight, mid upper-arm circumference and skin-fold thickness of the subjects were recorded, according to Jelliffe(1), during the last week of the third and sixth month of pregnancy. During the ninth month, the weight was recorded two weeks prior to the completion of the month. Post-partum weight of the women were recorded. Body mass index (BMI) was calculated to assess the nutrition of the subjects using the following formula:

$$\text{BMI} = \frac{\text{Wt (kg)}}{\text{Ht}^2(\text{m})}$$

For determining BMI, weight of the mother after 7 days of the delivery was noted, as suggested by Bhatia and Tyagi(2).

In addition, crown heel length, birth weight, skinfold thickness, mid upper arm circumference, head circumference and chest circumference of the neonates were recorded within eight hours of the delivery according to the methods of Jelliffe(1).

Ponderal index (PI) was calculated

using the following formula (Mohan *et al.*(3).

$$\text{PI} = \frac{\text{BW(g)}}{\text{CHL}^3 (\text{cm})} \times 100$$

Medical supervision and nutritional supplements: The number of visits to the subsidiary health centre made by each subject for antenatal check up were recorded both for the experimental (E) and control (C) groups. Folifer tablets (60 mg iron, 500 µg folic acid) and calcium (Sandoz) tablets (500 mg calcium gluconate, 15 mg ascorbic acid, 1 µg Vit B₁₂ and 100 IU Vit D₃) were supplied regularly to E group from 5th month till the delivery. The C group consumed only Folifer tablets. The consumption of nutritional supplements was monitored regularly.

Nutrition education: A pamphlet on "Diet during Pregnancy" was published in vernacular to distribute to the subjects of E group in their first trimester of pregnancy. Nutrition knowledge was also reinforced by four individual and three group contacts uniformly spread in the second half of the pregnancy.

The data was analysed statistically in the computer. Coefficients of correlation were calculated to measure the relationship of maternal and neonatal anthropometric measurements. Analysis of variance was used to study the effect of nutrition education and medical supervision on the anthropometry of pregnant mother and her neonate.

Results

Table I shows that in the present study the height of the subjects ranged from 145 to 167 cm. The average weight of the subjects during first trimester was 48.4 kg and 46.5 kg in groups E and C, respectively. The subjects belonging to group E had greater body

TABLE I—Anthropometric Indices of the Subjects During Pregnancy

Anthropometric measurements	Experimental			Control		
	Average	SE	CV%	Average	SE	CV%
I. Trimester						
Height (cm)	155.08	7.2	10.6	155.87	7.5	9.9
Weight (kg)	48.4	1.05	18.1	46.5	1.9	17.3
Mid-arm circumference (cm)	21.5	0.3	15.4	19.4	0.3	14.3
Tricep skinfold (mm)	14.56	0.3	15.6	14.0	0.27	15.0
II. Trimester						
Weight (kg)	52.3	7.9	12.1	49.6	7.6	14.2
Mid-arm circumference (cm)	22.3	0.2	14.2	22.02	0.25	13.7
Tricep skinfold (mm)	15.09	0.22	14.08	14.97	0.30	15.01
III. Trimester						
Weight (kg)	54.7	8.2	17.1	52.3	7.9	16.1
Mid-arm circumference (cm)	23.04	0.23	14.3	22.3	0.22	13.9
Tricep (mm)	15.36	0.20	12.1	15.28	0.24	14.24
Weight gain (kg)	6.30	1.4	20.97	5.73	1.2	24.32
Weight (postpartum) (kg)	47.3	3.3		45.6	3.1	
BMI	20.1	0.20		19.1	0.10	

weight than the subjects in C group, but the difference was not significant.

On the basis of NIN(4) classification it was observed that 27 and 53% of the subjects were undernourished in E and C groups, respectively. About 67% of the subjects were categorized as normal in E group in contrast to only 37% in C group. Based on the classification of BMI, it was observed that only 45.2 and 23.4% of the subjects belonging to E and C groups were normal, while 54.8 and 76.6% belonged to different grades of undernutrition in groups E and C, respectively.

The average weight gain ranged from 4.5 to 7 kg. The mean (SE) gain in weight was 6.3 (1.4) and 5.7 (1.2) in E and C groups

respectively. There was statistically significant ($p < 0.01$) difference in the weight gain of the two groups.

There was no statistically significant difference in the MUA circumference between E and C groups in all the three trimesters. There was an increase in the mid upper arm circumference during third trimester in both the groups.

None of the subjects in E and C groups went to the doctor for medical check up during the first trimester. During the second and third trimesters all subjects in group E visited a doctor for check-up and were vaccinated against tetanus. It was further observed that only 27% and 67% of the subjects of group C visited a doctor during

the second and third trimesters, respectively. It was also seen that 33% of the subjects in Group C did not visit a doctor even once during their whole of the gestation period.

All the subjects in E Group took one tablet each of Folifer and Calcium (Sandoz) regularly from the second trimester onwards. In case of Group C, 47% of the subjects consumed Folifer tablets during the third trimester of whom only 30% took them regularly. None of the subjects in Group C took calcium tablets as these were not supplied free of cost in the health centre.

The birth weight of neonates ranged from 2.1 to 3.2 kg, the mean (SE) values being 2.70 (0.71) and 2.30 (0.52) kg in Groups E and C, respectively (*Table II*). The average birth weight in Group E was significantly ($p < 0.01$) greater than Group C and was closer to ICMR reference standards(5). Majority of the babies (86.7%) in Group C weighed less than 2.5 kg in contrast to only 13.3% of the babies born in Group E. The

CHL varied from 41 to 48.5 cm in both the groups. There was statistically significant ($p < 0.01$) difference in the CHL in Group E as compared to Group C. The ponderal index values of the babies born to children of Groups E and C were 2.84 and 2.73, respectively (*Table II*); the difference was statistically significant ($p < 0.01$). The head circumference observed in the present study was very close to the ICMR norms(5). The difference in head circumference in the two groups was statistically insignificant. The values of chest circumference recorded in the present study was slightly higher than the standard norms set by ICMR. The mid upper arm circumference was greater in case of neonates belonging to Group E but was not significantly different from Group C. The observed values were lower than the standard norms.

The measurement of skinfold thickness was significantly ($p < 0.01$) higher in the neonates born to mothers in Group E (7.3 mm) as compared to Group C (6.4 mm).

TABLE II—Anthropometric Measurements of the Newborns

Anthropometric measurements	Newborns						
	Experimental (n = 30)			Control (n = 30)			ICMR* standards
	Average	SE	CV%	Average	SE	CV%	
Birth weight (g)	2700	171	18.03	2300	152	17.32	2750
Crown-heel length (cm)	46.03	0.23	4.71	44.51	0.27	5.61	48.0
Head circumference (cm)	32.7	0.14	4.59	33.32	0.15	3.87	33.0
Chest circumference (cm)	30.84	0.53	13.96	30.94	0.54	12.91	30.35
Mid arm circumference (cm)	8.81	0.19	15.67	8.39	0.13	16.01	12.1
Skinfold thickness (mm)	7.26	0.09	9.74	6.36	0.06	10.32	6-6.5**
Ponderal index	2.84	0.30		2.73	0.28		2.25-2.95***
Gestational age (weeks)	38.4	3.2		37.4	3.0		39-40****

* Gupta(5); ** Jelliffe(1); *** Mohan *et al.*(3); **** Bhargava *et al.*(6).

The results showed that there was significant ($p < 0.05$) correlation between anthropometric measurements of the mother and their neonates. Weight gain during the pregnancy had significant ($p < 0.05$) correlation to mid upper arm, birth weight and skinfold thickness of the neonates although the value of coefficient of correlation (r) were low, being 0.28, 0.26 and 0.26, respectively. Of the various neonatal anthropometric measurements maximum correlations were observed between mid upper arm circumference and skinfold thickness followed by chest circumference vs mid upper arm circumference and skinfold thickness, the value of ' r ' being 0.89, 0.79, 0.73, respectively. The results indicated that birth weight had significant ($p < 0.01$) correlation with the crown heel length, the value of ' r ' being 0.46.

Discussion

The present study shows the majority of the subjects in Group C took minimal health care and only 33% of the subjects in Group C did not visit the doctor even once during the whole of their gestation period. The weight and height observed in the present study were higher as compared to earlier studies conducted in India in the low income groups by Bhargava *et al.* (6) and Bhatia *et al.* (7). It could be due to the genetic as well as nutritional factors. These figures were, however, much lower than their European counterparts (8). The values of BMI in Groups E and C also fall within the range reported by Naidu *et al.* (9). The gain in weight in the present study was less than the range reported by others (10,11).

Naidu *et al.* (9) reported in a study conducted at NIN that 30.5% of the infants had low birth weight. In the present study 13.3% of low birth weight babies were observed in Group E, in contrast to 86.7%

of low birth weight babies in Group C. The values of crown heel length observed in both the groups were in the range reported by Devi *et al.* (12) and Vijayalakshmi and Lakshmi (13) but comparatively lower values of mid upper arm circumference was recorded in the present study. Similar observation has also been reported by Devadas *et al.* (14).

The maternal weight and weight gained during pregnancy showed significant positive correlation to the birth weight. Similar observations have also been reported by others (10,13,18).

The present study revealed that all the anthropometric measurements were greater in the neonates born to Group E. It could be due to relatively better dietary intake, regular intake of iron, folic acid and calcium and under the impact of nutrition education to the pregnant women. Others (16,18) too have reported similar observations.

A perusal of the data clearly indicated that regular medical supervision coupled with nutritional supplements and nutrition education improved the anthropometry of the mothers resulting in better obstetric outcome. Long term remedy therefore, consists of imparting nutrition education for which regular sessions may be held with the subjects along with medical supervision and nutrient supplementation.

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