PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 10 (8): 724-727, 2011
ISSN 1680-5194

Relationship Between Maternal Nutritional-Social Status and Pregnancy Outcomes

F. Borazjani[1], K.A. Ahmadi[2] and Parvin Shahri[3]
[1]Department of Anthropology, University of Pune, India
[2]Department of Biostatistics, [3]Department of Public Health,
Health Schools, University of Ahvaz, Jundishapur of Medical Sciences, Iran

Abstract: The aims of present study were to determine effect of maternal dietary intake and also socio-economical status on outcomes of pregnancy. A cross sectional study in Pune city Maharashtra state (India) was carried out among 156 singleton healthy pregnant women. Directly interview method was accomplished of the pregnant women who were visiting for their monthly check up. During each interview, information was sought concerning the demography background of pregnant women and 24 h diet recall and also food frequency questionnaire. Regression result showed the maternal fish, saturated oil and milk intake significant and positively contributed to birth biometrical parameters. While, unsaturated oil intakes was negatively associated. Moreover, birth size was influenced by maternal income-educational status. Subsequently, polynomial linearity test approved existence of increasing tendency among the variable. The study indicates that maternal dietary consumption can be considered as a reliable predictor of fetal growth. Similarly, educational status has an effect on fetal growth and pregnancy outcome.

Key words: Pregnant women, micronutrient, maternal educational-income level, birth parameters

INTRODUCTION

Consumption of a nutritionally adequate diet is of particular importance during pregnancy and has a considerable influence on birth outcomes. Contribution of numbers of factors influences the pregnancy outcomes such as: educational-income status, maternal anthropometric measurements and maternal dietary intake. Essential fatty acids play a major role during pregnancy. They provide the precursors for prostaglandins and leucotrienes and are present mainly in highly specialized membranes (retina and synapses). The consumption of essential fatty acids is deemed important for normal growth and development in infants. Great body of literature from both epidemiological observational studies showed longer gestation, larger babies associated with higher marine fatty acid, fish or fish oil intake. In many culture, milk is an important source of energy for both the pregnant women and the fetus. It is also a good source of calcium. The correlation between milk intake and birth weight seen in study by Ludvigsson (Olsen and Secher, 2002), may also be explained by the supply of micronutrients. Another study on fish intake among Danish women suggests that even small increases in a food containing critical micronutrients may suffice to affect pregnancy outcome (Ludvigsson and Ludvigsson, 2004). Hence, the present cross sectional study was accomplished to identify the effect of maternal micronutrient intake and social status on fetal growth.

MATERIALS AND METHODS

The present cross sectional study was conducted on 156 singleton healthy pregnant women. All women provided written informed consent and the study was approved by medical manager of Jehangir hospital and Gupte hospital and of the Research Recognize Committees of university of Pune. Sampling was completed during three months period (June-July-August 2009) according to the criteria of sample selection i.e. those pregnant women who fulfill the criteria of inclusion that is healthy singleton pregnant women and exclusion that are; any family history of congenital disease, suffering from chronic disease, any complicated position during pregnancy and also on the basis of their willingness to participate in the study. The respondents were met in last trimester of pregnancy and majority of them were in last month of pregnancy. The area of sampling was in two hospitals, Jehangir hospital and Gupte hospital in Pune city, Maharashtra state (India). Collecting information through personal interview was carried out in a structured way by use of a set of predetermined questions. During each interview information concerning the demographic background of pregnant mothers comprising of maternal educational and social circumstances, maternal anthropometric measurements and maternal dietary intake etc. Furthermore, birth measurements were recorded from birth record file that was available in obstetric department of the related hospital, including infant head

Corresponding Author: K.A. Ahmadi, Department of Biostatistics, Health Schools, University of Ahvaz Jundishapur of Medical Sciences, Iran

circumference, baby's birth length and baby's birth weight. Dietary assessment was accomplished by 24 h diet recall and FFQ (food frequency questionnaire) which was formulated based on the pattern of Indian food stuffs. Data processing and statistical analysis were performed by using SPSS 16. Inference statistics include of; ANOVA test between maternal income-educational status and birth parameters, maternal factors and polynomial linearity test to confirm the result of ANOVA test and also multiple regression model was applied between maternal dietary component and birth outcome.

RESULTS AND DISCUSSION

The characteristics of pregnant women it has been reported else where (Borazjani *et al*., 2011). Most of the respondents had the highest income conditions and a less number of them were in lower social class. The one way ANOVA test was performed to recognize an association between socio-income level of respondent with birth characteristic of baby and maternal dairy intake and pre-pregnancy BMI. Finally amongst these associations the ANOVA test showed a significant and positive relation with merely pre-pregnancy BMI ($p = 0.007$). Referring to the result by increasing the income levels, people acquired better BMI group and also it is indispensable to state that 51.3% of the respondent according to recommended allowance by IOM had normal pre-pregnancy BMI and entered into pregnancy period with suitable situation. Similarly all of the baby's birth parameters, maternal dairy consumption and also maternal pre-pregnancy BMI were progressed by enhancement of social income levels. In parallel to our study Som *et al.* (2004) observed that family income had a positive (i.e., increasing) relationship with birth weight. For birth weight, Cramer (1995) showed that women with higher income had larger babies. A study in Malaysia (DaVanzo *et al*., 1984) found that income correlated with birth weight. Lardelli *et al.* (1993) found out in Spain, family income was a strong determinant of infant mortality in the late 1970s, but health care indicators became more important in the 1980s. On an average majority of the women were in bachelor level (51.9%) and the rest placed in master, precollege, 35.9%, 12.2% respectively. More than half of the respondent 51.3% had normal pre-pregnancy BMI. Also majority of them were primpara. To identify the role of maternal education levels on growth of birth Parameters, macronutrient intake and various maternal confounders, one way ANOVA test were carried out and demonstrated that the significant positive associations were observed among two of baby's birth parameters, pre-pregnancy BMI and maternal intake of saturated oil. Evidently, maternal education level showed consistency in same increasing manner. And people with higher education had more propensities to consume saturated oil (Table 1). However, there is positive and significance association between the birth parameters, pre-pregnancy BMI and maternal saturated oil intake with maternal education level, but ANOVA test shows the difference mean of parameters among maternal education classes. Hence, polynomial linearity test performed to sure, whether exist enhancing tendency among the variables. Consequently, indicates the significant ascending association between birth weight ($p = 0.03$), birth length ($p = 0.027$) and pre-pregnancy BMI ($p = 0.001$) with maternal education classes. While, maternal saturated oil intake insignificantly associated. As a matter of fact, by enhancing the maternal education levels, the birth parameters and pre-pregnancy BMI were improved. In study by Som *et al.* (2004) there was a strong association between mother's educational status and birth weight, similarly the same trend of increasing birth weight with higher education has been observed by other investigators (Karim and Mascie-Taylor, 1997; Mondol, 2000). The finding regarding maternal work status, activity and age status has been reported else where (under processing). Multiple linear regression models were fitted to investigate the relation between maternal macronutrients, that has already been presented (Borazjani *et al*., 2011) and micronutrients intake during pregnancy as predictor variables and birth

Table 1: The association between maternal education level with birth parameters

Parameters	Education	N	Mean	Std. Deviation	p-value
Classes					
Birth weight (g)	<Precollege	19	2702.68	347.79	0.002
	Bachelor	81	2836.29	487.72	
	Master	56	2976.00	478.78	
Birth length (cm)	<Precollege	19	50.10	2.23	0.062
	Bachelor	81	50.44	1.85	
	Master	56	51.25	1.97	
Pre-pregnancy BMI	<Precollege	19	20.19	3.50	0.022
	Bachelor	81	22.69	3.63	
	Master	56	23.79	4.26	
Saturated oil (g/d)	<Precollege	19	19.36	13.19	0.004
	Bachelor	81	17.85	15.77	
	Master	56	28.68	20.42	

Table 2: Maternal dietary composition in pregnancy and birth dimensions of the baby

	Birth weight (g)		Birth length (cm)	
Dietary component	ß	P	ß	P
Fish intake	107.40	0.040	0.820	0.001
Saturated oil (g/d)	6.18	0.010	0.021	0.041
Unsaturated oil (g/d)	-5.825	0.006	-0.028	0.006
Milk intake (ml/d)	0.73	0.038	-0.002	NS

NS = Not Significant

characteristics of the baby included as dependent variables from the regression result (Table 2), Maternal fish intake exhibited independent relation to increase of the birth weight and birth length, in which each 1 gr increase in fish intake was associated to 107.4 gr, 0.81 cm rise in birth weight and birth length respectively. Inga Thorsdottir *et al.* (2004) reported that frequency of fish consumption was positively associated with infant birth length and head circumference and no linear association with birth weight. Several epidemiological studies conducted in Northern countries with usual high mean seafood intake as well as marine n-3 fatty acids by pregnant women found an association with an increased birth weight (Olsen, 1993; Hornstra, 2000; Allen and Harris, 2001; Facchinetti *et al.*, 2005). In the early 1990s, positive associations between maternal fish intake and birth weight were found during pregnancy in Danish fish eating communities (Olsen *et al.*, 1990; Olsen, 1993). In the same population, Olsen and Secher (2002) demonstrated a strong negative association of fish intake with the risk of both low birth weight and preterm delivery (Sumithra Muthayya, 2009). Maternal saturated oil intake was positively contributed to growth pattern of the birth weight and birth length of the offspring. In other hand each 1 gr increase in maternal saturated oil intake was related to 6.18 gr, 0.021 cm rise in birth weight and birth length respectively. Similarly, among urban affluent in India (Kanade *et al.*, 2008), maternal fat intake at 18 week were associated with birth weight and length of newborn. Therefore, maternal saturated oil intake and % of energy derived from fat, in our study can confirm that. However, the association in regarding to unsaturated oil and daily fat consumption was negative or insignificant. Daily maternal milk intake during gestational period showed positive significant contribution to birth weight; each 1 ml increase in milk consumption was associated with 0.73 (g) rises in offspring's birth weight. However, no association between milk intake during pregnancy period with birth length and head circumference of baby were evident among all participants. In a prospective study in India, birth weight, birth length, head circumference and placental weight were directly associated with frequency of milk intake assessed at 18 wk of gestation, but no associations were detected for milk intake assessed at 28 wk (Rao *et al.*, 2001). In a prospective study in Canadian women, overrepresented by women who restricted their milk intake, low milk intake tended to be associated with lower mean birth weight, but no association was seen with birth length or head circumference (Mannion *et al.*, 2006). Mannion *et al.* (2006) reported that women who consumed lower quantity of milk gave birth to infants who weighed less than those born to women who consumed more and also Infant lengths and head circumferences were similar. In parallel to our result, Fei Xue *et al.* (2008) reported that daily consumption of each additional glass of milk was associated with an increase of 0.6 g in birth weight (P for trend = 0.01). Ludvigsson and Ludvigsson (2004) conducted study among Sweden mothers and discovered the crude difference in birth weight between women consuming >10 dl of milk per day and women abstaining from milk during pregnancy was 134 g.

Moreover; this correlation may also be explained by the supply of micronutrients. In most cases, a lower intake of calcium will follow a low milk intake. Pregnant women have an increase need for calcium (Nordic Council of Ministers, 1996). Fei Xue *et al.* (2008) also reported that consumption of 2-3 and 4+ glasses of milk per day by the mother during pregnancy was associated with a 16 g ($p = 0.007$) and a 19 g ($p = 0.13$) increase, respectively, in birth weight when compared with consumption of $\leq$4 glasses per week (P for trend = 0.01). The mechanism of the relation of milk consumption to birth weight is largely unknown, but hormones and micronutrients, rather than the macronutrients and energy in milk seem to be more likely involved. In previous studies, above a minimal nutritional requirement for fetal growth, calorie and protein intake did not contribute much to the variability in birth weight (Mathews *et al.*, 1999; Godfrey *et al.*, 1996). In addition, the association of milk consumption with birth weight remained significant in some studies after additional adjustment for intake of energy and relevant macronutrients (Rao *et al.*, 2001) or consumption of vegetables, eggs, fish, iron supplement and vitamin supplement (Ludvigsson and Ludvigsson, 2004).

Conclusion: As a matter of fact, maternal dietary intake of macronutrients and micronutrients accounted as a determinant of fetal development. In addition, higher educated pregnant women had better concept of their situation during gestational period and subsequently acquired better pregnancy outcome.

ACKNOWLEDGMENTS

We acknowledge the respondent of the present study, who shared and provided the necessary information and also thanks to the head of hospitals that allowed us to visit the respondents and complete the interview. We also thankful of nurse staff for their co-operation and assistance. And without whose co-operation the study would have been incomplete.

REFERENCES

Allen, K.G. and M.A. Harris, 2001. The role of n-3 fatty acids in gestation and parturition. Exp. Boil Med. (Maywood), 226: 498-506.

Borazjani, F., S.S. Kulkarni and K.A. Ahmadi, 2011. Impact of maternal factors on birth parameters in urban affluent pregnant women. Pak. J. Nutr., 10: 325-327.

Cramer, J.C., 1995. Racial and ethnic differences in birth weight: The role of income and financial assistance. Demography, 32: 231-247.

DaVanzo, J., J.P. Habicht and W.P. Butz, 1984. Assessing socioeconomic correlates of birth weight in peninsular Malaysia: Ethnic differences and changes over time. Soc. Sci. Med., 18: 387-404.

Facchinetti, F., M. Fazzio and P. Venturini, 2005. Polyunsaturated fatty acids and risk of preterm delivery. Eur. Rev. Med. Pharmacol. Sci., 9: 41-48.

Fei Xue, C. Walter Willett, A. Bernard Rosner, R. Michele Forman and B. Karin Michels, 2008. Parental characteristics as predictors of birth weight. Human Reprod., 23: 168-177.

Godfrey, K., S. Robinson, D.J.P. Barker, C. Osmond and V. Cox, 1996. Maternal nutrition in early and late pregnancy in relation to placental and fetal growth. BMJ, 312: 410-414.

Hornstra, G., 2000. Essential fatty acids in mothers and their neonates. Am. J. Clin. Nutr., 71 (Suppl.): 1262S-1269S.

Inga Thorsdottir, E. Bryndis Birgisdottir, Sveinbjorg Halldorsdottir and T. Reynir Geirsson, 2004. Association of fish and fish liver oil intake in pregnancy with infant size at birth among women of normal weight before pregnancy in a fishing community. Am. J. Epidemiol., Vol. 160, Printed in USA.

Kanade, A.N., S. Rao, R.S. Kelkar, MCM and S. Gupte, 2008. Maternal nutrition and birth size among urban affluent and rural women in India. J. Am. Coll. Nutr., 27: 137-145.

Karim, E. and C.G. Mascie-Taylor, 1997. The association between birth weight, socio-demographic variables and maternal anthropometry in an urban sample from Dhaka, Banghladesh. Ann. Hum. Biol., 24: 387-401.

Lardelli, P., J.I. Blanco and M. Delgado-Rodriguez, 1993. Influence of socioeconomic and health care development on infant and perinatal mortality in Spain 1975-86. J. Epidemiol. Community Health, 47: 260-264.

Ludvigsson, J.F. and J. Ludvigsson, 2004. Milk consumption during pregnancy and infant birth weight. Acta Paediatr., 93: 1474-1478.

Mannion, C.A., K. Gray-Donald and K.G. Koski, 2006. Association of low intake of milk and vitamin D during pregnancy with decreased birth weight. Can. Med. Assoc. J., 174: 1273-1277.

Mathews, F., P. Yudkin and A. Neil, 1999. Influence of maternal nutrition on outcome of pregnancy: Prospective cohort study. Br. Med. J., 319: 339-343.

Mondol, B., 2000. Risk factors for low birth weight in Nepali Infants. Ind. J. Pediat., 67: 477-482.

Nordic Council of Ministers, 1996. Nordic nutrition recommendations. Scandinavian J. Nutr., 40: 161-165.

Olsen, S.F., J. Olsen and G. Frische, 1990. Does fish consumption during pregnancy increase fetal growth? A study of the size of the newborn, placental weight and gestational age in relation to fish consumption during pregnancy. Int. J. Epidemiol., 19: 971-977.

Olsen, S.F., 1993. Consumption of marine n-3 fatty acids during pregnancy as a possible determinant of birth weight. A review of the current epidemiologic evidence. Epidemiol. Rev., 15: 399-413.

Olsen, S.F. and N.J. Secher, 2002. Low consumption of seafood in early pregnancy as a risk factor for preterm delivery: Prospective cohort study. Br. Med. J., 324: 447.

Rao, S., C.S. Yajnik, A. Kanade, C.H. Fall, B.M. Margetts and A.A. Jackson, 2001. Intake of micronutrient-rich foods in rural Indian mothers is associated with the size of their babies at birth: Pune Maternal Nutrition Study. J. Nutr., 131: 1217-1224.

Som, S., M. Pal, D.K. Adak, A.K. Gharami, S. Bharati and P. Bharati, 2004. Effect of socio-economic and biological variables on birth weight in Madhya Pradesh, India. Mal. J. Nutr., 10: 159-171.

Sumithra Muthayya, 2009. Maternal nutrition and low birth weight-what is really important? In. J. Med. Res., 130: 600-608.