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Occupation, Caloric Intake and Rest during Day Time of Pregnant Women and Birth Weight and Gestational Age of the Baby

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Abstract

With the social and economic changes in recent years, women's role has also significantly changed and with a considerable share of the job market, i.e., 42%. If the burden of pregnancy and child birth is added to it, it could be stressful to the mother and likely to affect the birth weight as well as gestational age of the baby adversely. A study to find out relationship between occupation of women and the birth weight and gestational age of the baby was undertaken at Krishna Hospital; Karad. The data was collected on randomly selected 380 pregnant women by using structured interview schedule at registration and followed them till delivery. Data was analyzed in respect to the objectives of the study by using descriptive and inferential statistics. There were 23(6.0%) heavy workers. All of them were working on road construction sites and delivered 19(82.8%) Low Birth Weight (LBW) babies out of them 06(26.1%) were preterm births. The mean birth weight and Gestational age of babies born to heavy workers were 2199.1 ± 488.5g and 262.3±18.6 days as compared to 2764.4 ± 463.7g and 274.0±13.4 days for moderate workers 2688.8± 475.5g and 275.6±13.1 days for sedentary workers respectively. The study concluded that heavy maternal physical activity had a significant deleterious effect on birth weight and gestational age.

Keywords: Birth Weight, Gestational Age, Low Birth Weight, Maternal Risk Factors, Preterm Birth

1. Introduction

Very few studies have examined the relationship between maternal physical activity and neonatal size[1]. The study conducted by Shobha Rao et al., in Pune in 2003 have concluded that excessive maternal activity during pregnancy is associated with smaller fetal size in rural India[1]. In the present study maternal risk factors were studied as a part of PhD thesis of Community Health nursing on 1876 mothers and in-depth study on occupation of mothers was undertaken on a subset of 380 mothers which is presented in the paper. There are not many studies examining relationship between type of work done by the pregnant mothers and its effect on birth weight and preterm birth of the baby. Many studies have shown the relationship between maternal intake of nutrients and Low Birth Weight but very few studies have been conducted on nutritional intake and gestational period. Influence of work and rest during pregnancy and their effect on both birth weight and gestational age are not much studied. Work, rest and caloric intake are interrelated. A person doing hard work needs more intake of calories to provide energy for the work, has less time to rest. During rest the BMR is lower and caloric requirement is less. Therefore, study of these inter-related factors namely type of work, caloric intake and rest during day time were studied together.

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2. Objective

- To identify physical activity influencing on birth weight and gestational age of babies.
- To find relationship between selected maternal risk factors and birth weight and gestational age.

3. Material and Method

A comparative, exploratory approach and a prospective cohort study design were used to identify physical activity influencing on birth weight and gestational age of babies. The data was collected by using pretested structured interview schedule. The study was undertaken in Krishna Hospital Karad, Maharashtra, India. The women were classified into broad categories of sedentary, moderate and heavy work as per ICMR Guidelines as follows[2]

Type of work	Groups	RDA
Sedentary	Housewives, Teacher, Beauty parlor, tailor	2250 kcals
Moderate	Working on own farms and others' farm.	2850 kcals
Heavy	Working as laborer on road construction, stone cutting.	3200 kcals

The independent variable was maternal occupation (physical activity) and dependent variables were the birth weight and gestational age of babies. In the present study sample consisted of randomly selected 380 women registered during period of data collection i.e. from 1st November 2013 and continued till the desired sample size of 1844 was reached. 10% more enrollments were done in view of outcome of stillbirth, twins, triplets and the changing the place of delivery so 2088 women were enrolled. There were 71 still birth, 32 twins, 1 triplets and 48 though planned to deliver at Krishna Hospital, delivered outside hence 152 women were excluded. Thus the cohort of 1876 was analyzed for the study of LBW and preterm deliveries. All randomly selected eligible mothers were followed up till delivery. The sample size was computed with the assumption of prevalence LBW 28% and of preterm births of 23 % as per (NHFS-3 Survey) precision of 4 % and level of significance at p = < 0.05. The minimum sample sizes calculated were (N = 323) and (N = 313) respectively. The maximum of these two minimum sample sizes was 323 to which 10 % was added for exclusion criteria. Thus the required sample size was 356. Data was analyzed by SPSS version 16 using descriptive and inferential statistics. Informed consent of all participants and approval of the ethics committee were obtained before commencement of the project.

Descriptive Statistics- Frequency, percentage Mean and SD wherever applicable.

Inferential Statistics- Chi-square (χ^2) test was used to see an association with respect to maternal risk factors for qualitative data and ANOVA (Bonferroni multiple comparison test) and 't' test for quantitative data.

4. Results

There were 109 (28.7%) women categorized as sedentary workers. Out of these 94 (86.2%) were only housewives, 13 (11.9 %) were doing service as primary school teacher, 2 (1.8 %) were self-employed (as having a beauty parlor and a Tailor). There were 248 (65.3%) moderate workers. Who worked on their own farms or on others' farms. There were 23 (6.0%) heavy workers, all of them were working as laborer on road construction. There was no significant difference between the age, parity, income, residence and type of family and the category of work of pregnant women. However, a significant difference was observed in relation to education. ($\chi^2 = 68.557$; $p < 0.001$). Out of 380 pregnant women, 75% of heavy workers, 25% of moderate workers and none of the sedentary workers were illiterate. The mean birth weight was lowest for babies of the heavy workers followed by sedentary workers and it was highest for moderate workers. The proportion of LBW was very high i.e., 82.6% for heavy workers and 23.8% and 24.8% for moderate and sedentary workers respectively. The RR for heavy workers was 3.4 with a Confidence Interval (CI) 2.637 to 4.460. ($\chi^2 = 37.041$; $p < 0.001$; ANOVA $F = 15.450$; $p < 0.001$). Bonferroni multiple comparison test: Heavy Vs Sedentary and Moderate work $p < 0.001$.

The Mean gestational age of babies born to sedentary workers was highest i.e. 275.5 days and for heavy workers it was lowest i.e.262.3 days (ANOVA $F = 9.120$, $p < 0.001$). Bonferroni multiple comparison test showed Sedentary Vs Heavy Vs and Moderate work $p < 0.001$.

The proportion of preterm births was lowest i.e., 6.4% for sedentary workers which showed increase (14.1%) for moderate workers and it was very high i.e., 26.1% for heavy workers. ($\chi^2 = 8.075$; $p < 0.018$).

Table 1. Type of work and mean birth weight and proportion of LBW according caloric intake of< RDA and ≥ RDA [N=380]

Variables	No.	%	Mean Birth Weight ±SD	N0.(%) LBW	χ2 value p-value	RR	95% CI
Sedentary workers							
< RDA	53	13.9	2491.1±389.4	24 (45.3)	χ2 =23.200 **p<0.0001**	8.453 (1)	2.703 to 26.426 **p<0.001**
≥ RDA	56	14.7	2875.9±476.7	03 (5.4)			
Sub Total	**109**	**28.6**	**2683.5±433.0**	**27 (25.3)(24.8)**			
Moderate workers							
< RDA	149	39.2	2582.2±440.2	58 (38.9)	χ2 =45.095 **p<0.0001**	38.537 (1)	5.424 to 273.82 **p<0.001**
≥ RDA	99	26.1	3038.6±350.7	01 (1.0)			
Sub Total	**248**	**65.3**	**2810.4±395.45**	**59 (19.9)(23.8)**			
Heavy workers*							
< RDA	23	6.1	2199.1±488.5	19 (82.6)		3.429	2.637 to 4.460 **p<0.001**
Sub Total	23	6.1	2199.1±488.5	19 (82.6)			
< RDA	**225**	**59.2**	2424.1± 439.3	**101 (26.5)**	χ2 =82.153 **p<0.0001**	17.394 (1)	6.540 to 46.267 **p<0.001**
≥ RDA	**155**	**40.8**	2957.2± 413.7	**04 (1.05)**			
Grand Total	**380**	**100**	**2564.3±439.0**	**105 (42.6) (27.6))**			

Table 2. Type of work and mean gestational age and proportion of preterm according caloric intake of < RDA and ≥ RDA [N = 380]

Variables	No.	%	Mean GA± SD(Days)	N0. (%) preterm births	χ2 value p- value	RR	95% CI
Sedentary workers							
< RDA	53	13.9	273.5±15.3	05 (9.4)	χ2 =0.7345 p = 0.3914	2.642 (1)	0.5351 to 13.039 p = 0.2622
≥ RDA	56	14.7	277.6±10.3	02 (3.6)			
Sub Total	**109**	**28.6**	**275.5±12.8**	**7 (6.5)**			
Moderate workers							
< RDA	149	39.2	271.1±14.5	30(20.1)	χ2 =9.955 **p = 0.0016**	3.987 (1)	1.601 to 9.926 **p = 0.0007**
≥ RDA	99	26.1	278.2±10.1	05 (5.1)			
Sub Total	**248**	**65.3**	**274.6±12.3**	**35 (12.6)**			
Heavy workers*							
< RDA	23	6.1	262.3±18.6	06(26.1)		2.217	1.053 to 4.668 **p = 0.0554**
Sub Total	23	6.1	262.3±18.6	06(26.1)			
Total							
< RDA	**225**	**59.2**	268.9 ± 6.1	**41 (10.7)**	χ2 =15.622 **p < 0.0001**	4.035 (1)	1.859 to 8.760 **p < 0.001**
≥ RDA	**155**	**40.8**	277.9± 10.2	**07 (1.8)**			
Grand Total	**380**	**100**	**270.8±14.5**	**48(15.0) (12.6)**			

Table 3. Type of work, rest during pregnancy, mean birth weight and gestational age of mothers and proportion of LBW and preterm births [N = 380]

Hours of Rest during day time	No. (%)	Mean Birth weight ± SD in g	Mean Gestational age ± SD in days	No (%) of LBW	No (%) of Preterm
< 2	22 (25.6)	1886.4 ± 494.7	261.3 ± 18.7	20 (90.9)	7 (31.8)
≥ 2	358 (74.4)	2698.9 ± 445.0	274.5 ± 13.8	85 (23.7)	41 (11.4)
Total	**380 (100)**	**2292.6 ± 469.8**	**267.9 ± 16.2**	**105 (27.6)**	**48 (12.6)**

[$\chi^2 = 46.759$; $p < 0.001$] for LBW; $\chi^2 = 7.789$; $p = 0.005$ for preterm births]

The RDA for different category of work is different namely *2250 kcal* for sedentary, *2580 kcal* for moderate and *3200 kcal* for heavy work during pregnancy. As compared to RDA the deficit in calorie for sedentary workers was 10.8 kcal i.e. (0.48%) for moderate 152.0 kcal i.e. (6.25%) and for heavy workers was 1169 kcal i.e. (57.5%).

Type of work and calorie intake - Sedentary workers had a mean calorie intake of 2239.2 ± 385.1 as compared to 2428.9 ± 397.4 for moderate and 2031.4 ± 401.0 for heavy workers. (ANOVA F = 16.789, $p < 0.001$); Bonferroni multiple comparison test: Moderate Vs sedentary and heavy work $p < 0.001$. The mean birth weight and the mean gestational age were significantly lower and the proportion of LBW and preterm births were significantly higher among babies born to the mothers consuming less than the RDA for the occupational group as compared to the consuming equal to or more than the RDA for the respective occupational groups.

It was observed that the proportion of women who could take rest of two hours or more during day time was 98.2 %, among sedentary workers 98.8 % among moderate workers and the proportion was significantly lower and 26.1% among heavy workers. [$\chi^2 = 46.759$; $p < 0.001$; Unpaired t = 108.54; $p < 0.001$; for LBW; $\chi^2 = 7.789$; $p = 0.005$; Unpaired t = 379.55; $p < 0.001$ for Preterm births]. It was also observed that the mean birth weight and the mean gestational age were significantly higher and the proportion of LBW and the mean gestational period were significantly lower among the babies born to those who were taking rest of two hours or more during day time as compared to those who could not to do so.

5. Discussion

In the present study there were 23 (6.0 %) heavy workers. All of them were working as laborer on road construction and delivered 19 (82.8%) LBW and had 06 (26.1%) preterm births. The rate of illiteracy was significantly more i.e., 26.1%, and practice of taking rest of two hours during pregnancy during day time was significantly lower (26.1%) among them. The mean calorie deficit was highest i.e. 1169 (57.6%) for heavy workers as compared to the sedentary workers of 10.8 calories (0.48%) and moderate workers of 152 calories (6.25%). The combined effect of all these adverse factors could be responsible for the significantly high proportion of LBW and preterm births observed in babies born to the heavy workers. Similar observations were found by various researchers from Nepal by S. R. Sharma et al.,[3] and Fourn L et al.,[4] noted that hard physical work during pregnancy was found to be significantly associated with LBW (12-32%)[3]. It was noted in second study that lifting heavy loads during pregnancy has been shown to be one of the risk factors for low birth weight[4]. Gulnazlltaf et al., from Pakistan[5] observed that high incidence of LBW babies was seen in laborer class women compared to house wives. Earlier studies by Viengsakhone (2010)[6] and Nobile et al., (2007)[7] indicated that the work stress during pregnancy affected the birth weight of newborns.

Indian studies have quoted a significantly higher proportion of LBW among babies born to the hard-working pregnant women. The study conducted by Tafari N et al[8]., in South India noted that if heavy physical labor was undertaken by the mothers during pregnancy it affected fetal growth when such mothers had calorie intakes which were below 70% of WHO/FAO recommended standards. Another study conducted by N. Swarnalatha et al.,[9] at Tirupati, in Andhra Pradesh noted that the proportion of LBW was high in mothers who were laborers by occupation (27.4%) but it was not statistically significant. One more study by Singh et al., in Ahmadabad, also noted similar findings[10]. The study conducted by Agarwal S et al.,[11] in New Delhi suggest that hard physical activity in the undernourished (pre-pregnancy) women, with low caloric intake caused fetal growth retardation (weight as well as length). The study further suggested that longer period of rest in the

third trimester increased maternal weight gain during pregnancy. Agarwal A. et al. in Uttar Pradesh also showed similar relationship between physical work of mother and LBW[12]. None of the studies have examined the gestational period and found out the effect of all the three variables namely rest, activity and the caloric intake on birth weight and gestational age. In our work we have studied these three variables categorizing type of work, actual intake of calories and rest during day time and have found them to be strongly associated with the birth weight and gestational period of the baby. The sociodemographic factors of mother are known to influence the birth weight of the baby. So the distribution of all sociodemographic variables namely age parity, income, residence and type of family and literacy status were studied for the three occupational group namely sedentary, moderate and heavy workers. None of the variables except illiteracy were different in different occupational groups indicating that they were not responsible for the observed differences in the birth weight and the gestational age of the baby among different occupational groups. However, there was a significant difference in the distribution of illiterate and literate pregnant women. No mother was illiterate among sedentary worker. The proportion of illiterate pregnant women was only 0.8% among moderate and 26.1% among heavy workers. This indicated that illiteracy was more among heavy workers. A separate study is needed to be undertaken to find out role of illiteracy in determining the type of work by the women.

6. Limitation of Study

- It is hospital based study of a tertiary care hospital attached to a medical college.
- Registration of women with bad obstetric history and complication during previous pregnancies could be more for obtaining better outcome in current pregnancy.

7. Conclusions

Hard work, illiteracy and lack of calories and lack of rest during daytime together were found significantly related and were associated with lower birth weight with lower gestational age and significantly higher rate of low birth weight and preterm births.

8. Recommendations

- At the time of registration, hard work can be identified and marked on ANC cards for possible remedial measures by health providers of the pregnant women and the family members. An alternative work to road construction and stone cutting may be provided by the Govt. on priority basis to women during pregnancy in such a way that their daily wages will be ensured but they do not have to put in hard work during pregnancy. Such an action in all urban and rural areas would go a long way in achieving the MDG 5 of prevention of LBW and preterm births.
- Improvement in female literacy and improved antenatal care coverage will be of paramount importance in prevention of LBW and preterm births.
- Ensuring dietary intake as per RDA for each type of work can result in favorable birth weight and gestational age.

9. References

1. Rao S, Kanade A, Margetts BM, Yajnik CS, Lubree H, Rege S, Desai B, Jackson A, Fall CHD. Maternal activity in relation to birth size in rural India. The Pune Maternal Nutrition Study Eur J Clin Nurr. 2003 Apr; **57**(4):531–42. DOI: 10.1038/sj.ejcn.1601582
2. Gopalan C, Sastri BVR, Balasubramanian SC. Nutritive value of Indian foods. Rao BSN, Deosthale YG, Pant KC, editor. Hyderabad, India: National Institute of Nutrition, Indian Council of Medical Research; 2011.
3. Sharma SR, Giri S, Timalsina U, Bhandari SS, Basyal B, Wagle K, et al. Low birth weight at term and its determinants in a tertiary hospital of Nepal: A case-control study. PLoS ONE. 2015 Apr 8; **10**(4):e0123962. DOI: 10.1371/journal.pone.0123962.
4. Fourn L, Ducic S, Seguin L. Factors associated with low birth weight: A multivariate analysis. Sante. 1999; **9**:7–11. PMID: 10210796.
5. Iltaf G, Shahid B, Khan MI. Incidence and associated risk factors of low birth weight babies born in Shaikh Khalifa Bin Zayad Al-Nayan Hospital Muzaffarabad, Azad Jammu and Kashmir. Pak J Med Sci. 2017; **33**(3):626–30. crossref
6. Viengsakhone L, Yoshida Y, Harun-Or-Rashid M, Sakamoto J. Factors affecting low birth weight at four central hospitals in vientiane, Lao PDR. Nagoya J Med Sci. 2010 Feb; **72**(1-2):51–8. PMid:20229703

7. Nobile CGA, Raffaele G, Altomare C, Pavia M. Influence of maternal and social factors as predictors of low birth weight in Italy. BMC Public Health. 2007; **7**:192. crossref.
8. Tafari N, Naeye RL. Effects of maternal undernutrition and heavy physical work during pregnancy on birth weight. Br J Obstet Gynaecol. 1980 Mar; **87**(3):222–6. crossref PMid:7387925
9. Swarnalatha N et al. An epidemiological study of low birth weight in a tertiary care hospital, Tirupati, Andhra Pradesh. Int J Cur Res Rev. 2013 Aug; **05**(16):54–62.
10. Singh S, Shrestha S, Marahatta S. Incidence and risk factors of low birth weight babies born in Dhulikhel Hospital. Journal of Institute of Medicine. 2011 Jun. crossref.
11. Agarwal S, Agarwal A, Agarwal KN, Agarwal DK, Bansal A. Physical activity and pregnancy outcome in rural undernourished women. Indian pediatrics. 2001; **38**:1017–22. PMID: 11568377.
12. Agarwal A, Agarwal K, Agrawal P, Agrawal V, Chaudhary V. Prevalence and determinants of "low birth weight" among institutional deliveries. 2011. p. 48–52.