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Original Research Article

Influence of maternal occupation on adverse pregnancy outcomes in a Nigerian tertiary health facility

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ABSTRACT

Background: There is accumulating evidence that the type of work and environmental exposures in the work environment during pregnancy may have adverse effects on fetal development and pregnancy outcome. The objective was to determine the influence of maternal occupation on adverse pregnancy outcomes.
Methods: The study was a prospective hospital based study conducted at the obstetrics and gynecology department of a tertiary health facility in Nigeria. All the data were retrieved from the ante natal and delivery card of all the women that delivered at the unit within the time of data collection. Data was analyzed using SPSS version 25 and variables were presented as frequencies, percentages, means, and standard deviation. Bivariate analysis was done using chi-square test. The level of significance was set at p value ≤ 0.05.
Results: Maternal occupation did not significantly affect the gestational age at delivery (X^2=10.143, p=0.428) and birth weight (X^2=16.807, p=0.079) however, it significantly affected the still birth (X^2=28.134, p=0.002). Agricultural, forestry and fishery workers and plant and machine operators were about 8 times and 17 times more likely to have still birth than the unemployed respectively.
Conclusions: There were substantial differences in the risk of adverse pregnancy outcomes between the different occupational groups.

Keywords: Low birth weight, Maternal occupation, Pregnancy outcomes, Preterm delivery, Still birth

INTRODUCTION

A large variety of physical, psychological, chemical and social factors as well as different physical loads occurring in the workplace have been found to increase the risk of adverse pregnancy outcomes including pre-term delivery (PD), low birth weight (LBW) and still birth.[1-3] The proportion of women employed during pregnancy has continued to increase in recent times and women are working in a broader range of occupations than before. There is accumulating evidence that the type of work and environmental exposures in the work environment may have adverse effects on foetal development and pregnancy outcome.[1,2] Today, women constitute almost half of the workforce in many European countries, and most women work during their reproductive years.[4] Though, this is so, studies on the relationship between employment during pregnancy and reproductive health have yielded contradictory results.[5-7] A number of chemical and physical agents present in the workplace or related to work organization have been suspected to interfere with the normal reproductive process. [1] For some chemicals, such as anaesthetic gases, toxic metals, and specific solvents, the evidence is quite compelling[2]whereas for most agents and factors, there is large uncertainty and, if any association exists, it seems of

modest magnitude.[8] Occupational sectors, for instance the health sector or cleaning work, have the characteristics of employing a large number of women and cumulating several potential hazards according to distinct exposure patterns. As at 2019, the world bank reported that 61% of the workforce in Sub Saharan Africa were women while women contributed 49% of the workforce in Nigeria.[9] In Nigeria, women contribute between 40-70% of the workforce in Agriculture.[10]

Low birth weight (LBW) have been found to be associated with many chronic conditions in later life, including obesity, hypertension and coronary heart diseases.[11,12] Infants that are born with LBW are at a higher risk of death in the first year of life with lower educational attainment and income earnings in adult life.[13,14] As at 2016, women made up 46.8% of the total US labour force and about 75% of the women in their prime reproductive age (25-34 years), were working. Several studies have investigated maternal occupational exposures during pregnancy and birth outcomes.[15] Several studies have found associations with adverse birth outcomes and work related chemical exposures (e.g. solvents, toxic metals) and/or physical hazards (e.g. lifting, standing for long durations), although contradictory evidence exists.[1,2,16,17] Other studies have found associations between LBW and work- related psychosocial exposures, for example, job strain as measured by the job demand/control model.[18] Some indicators of employment conditions, when evaluated in isolation, have been associated with higher risk of LBW; this includes atypical or non- permanent contracts, long working hours and shift work.[14,19] Perinatal stress is thought to impact the hypothalamic pituitary adrenal axis and affect fetal growth during pregnancy.[20] Similarly, women with irregular working time arrangements had 1.27 (95% CI: 1.00 to 1.61) times the risk of having a LBW infant compared to women with regular working times after adjustment.[21]

PD is the leading cause of neonatal morbidity and mortality; and the second most leading cause of under-five death in the world.[22,23] It is also a risk factor for LBW. Stress and heavy physicalwork have been reported as risk factors for PD.[22,24] Stillbirth is one of the major adverse perinatal outcome across the globe.[25] It varies from country to country. Even in countries it varies from locality to locality. These variations can be attributed to the availability of health care manpower in these places and general educational level of mothers. Maternal occupation have been reported as a risk factor for still birth as occupations that involves long standing and working in extremely hot environments have been shown to result in adverse pregnancy outcomes including still birth.[26] To the best of our knowledge no study has evaluated the relationship between maternal occupation and adverse pregnancy outcome in Enugu State, Nigeria. The objective of the study was to determine the influence of maternal occupation on adverse pregnancy outcomes (low birth weight, preterm delivery and still birth).

METHODS

Study design, location and population

Current study was a prospective hospital based study carried out at the obstetrics and gynaecology (O&G) department of Enugu State University teaching hospital (ESUTH) Park Lane Enugu. ESUTH provides tertiary health care to the inhabitants of the State and neighbouring States. It is centrally located within the Metropolis. All the women that delivered at the (O&G) department of ESUTH Park Lane Enugu within the time of data collection from 1 July 2020 to 31 January 2021 were included for the study.

Inclusion criteria

Inclusion criterion for current study was all mothers that delivered at a gestational age of ≥28 weeks.

Exclusion criteria

Exclusion criterion for current study was all mothers whose occupational history were missing

Data collection methods

Data was collected for a period of 7 months (1 July 2020 to 31 January 2021). All the information were retrieved from the patients ante natal and delivery cards. Research assistants which included 5th year medical students were used for data collection. They were trained for a week on the data to be retrieved and how to retrieve them from the clients' cards. Each morning they retrieve the folders of the women that delivered the previous day and fill in the data in a structured pro forma. This was done before the folders were taken to the central card room. The occupations were grouped into ten based on the ISCO-08 (international standard classification of occupations – 2008) code.

Data management

Independent variable taken was maternal occupation, and dependent variable was adverse pregnancy outcomes (preterm delivery, low birth weight and still birth).

Statistical analysis

All the data were entered into IBM statistical package for social sciences (SPSS) software version 25. Data was edited for errors by generating frequencies. Quantitative variables were summarized using means and standard deviation while categorical variables were summarized using frequencies and percentages. Chi-squared test was used to test for associations between variables with significant level placed at $p \leq 0.05$. All the variables that had $p<0.2$ on the bivariate analysis were inputted for multivariate logistic regression. Odds ratio together with their corresponding p values and confidence intervals

were computed based on a two tailed test and performed at a 5% error rate.

RESULTS

The socio-demographic characteristics of the study participants are shown in (Table 1). Their mean age was 29.76±4.69 while most of the women were aged 21-30years 431 (56.0%). Majority were married 746 (96.9%), Igbos 763 (99.1) and Christians 766 (99.5%). About a third of them were unemployed 241 (31.3%) while among those employed, most were professionals 215 (27.9%). Most of their husbands were services and sales workers 289 (37.5%) followed by professionals 273 (35.5%). Majority of both women 484 (62.9%) and their husbands 550 (71.4%) had tertiary education. Majority had 1-2 children 531 (69.0%).

The adverse pregnancy outcomes in the studied population are shown in (Table 2). About 13.3% of the mothers had preterm delivery, 10.5% had LBW babies while 4.0% had still birth. The maternal occupations that affected gestational age, birth weight and still birth are shown in (Table 3). Maternal occupation did not significantly affect the gestational age (χ^2=10.143, p=0.428) and birth weight (χ^2=16.807, p=0.079) at delivery however, it significantly affected still birth (χ^2=28.134, p=0.002). Highest proportion of preterm delivery (33.3%) and low birth weight (40%) was found among skilled agricultural, forestry and fishery workers. Plant and machine operators had the highest proportion of still birth (33.3%).

Predictors of birth weight and still birth are shown in (Table 4). Services and sales workers and skilled agricultural, forestry and fishery workers positively predicted birth weight. Skilled agricultural, forestry and fishery workers were about 8 times more likely to have babies with low birth weight than the unemployed while services and sales workers were about 2 times more likely to have low birth weight babies than the unemployed. Plant and machine operators positively predicted still birth and were about 17 times more likely to have still birth than the unemployed.

Table 1: Socio-demographic characteristics of the respondents.

Variables	Frequency	%	Variables	Frequency	%
Age in years (N=770)			**Husbands occupation**		
Mean ±SD	29.76±4.69		Armed forces	20	2.6
Age in groups (years)			Managers	12	1.6
≤20	14	1.8	Professionals	273	35.5
21-30	431	56.0	Technicians and associate professionals	53	6.9
31-40	318	41.3	Clerical support workers	20	2.6
41-50	7	0.9	Services and sales workers	289	37.5
Marital status			Skilled agricultural, forestry and fishery workers	8	1
Married	746	96.9	Craft and related trade workers	30	3.9
Single	24	3.1	Plant and machine operators	44	5.7
Ethnicity			Elementary occupation	5	0.6
Igbo	763	99.1	Unemployed	3	0.4
Others	7	0.9	NA	13	1.7
Religion			**Educational level**		
Christianity	766	99.5	Tertiary	484	62.9
Islam	4	0.5	Secondary completed	281	36.5
Occupation			Primary completed	5	0.6
Armed forces	1	0.1	**Husbands educational level**		
Managers	2	0.3	Tertiary	550	71.4
Professionals	215	27.9	Secondary completed	187	24.3
Technicians and associate professionals	15	1.9	Primary completed	5	0.6
Clerical support workers	21	2.7	NA	28	3.6
Services and sales workers	175	22.7	**Parity**		
Skilled agricultural, forestry and fishery workers	6	0.8	1-2	531	69.0
Craft and related trade workers	83	10.8	3-4	196	25.6
Plant and machine operators	6	0.8	≥5	43	5.4
Elementary occupation	5	0.6			
Unemployed	241	31.3			

Table 2: Adverse pregnancy outcomes.

Variable	Frequency	Percentage
GA at delivery (weeks)		
Mean±SD	38.19±2.43	
GA at delivery in group (weeks), N=709		
37-40	615	86.7
<37	94	13.3
Birth weight (kg)		
Mean ±SD	3.09±0.68	
Birth weight in group (kg), N=763		
>2.5	683	89.5
<2.5	80	10.5
Still birth, N=770		
Yes	31	4.0
No	739	96.0

Table 3: Maternal occupation that affect the gestational age, birth weight and still birth at delivery.

Variable	Preterm delivery <37 weeks		Low Birth weight <2.5kg N=763		Still birth	
	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)
Armed forces	1 (100)	0 (0.0)	1 (100)	0 (0.0)	1 (100)	0 (0.0)
Managers	2 (100)	0 (0.0)	2 (100)	0 (0.0)	2 (100)	0 (0.0)
Professionals	191 (88.8)	24 (11.2)	195 (91.1)	19 (8.9)	212 (98.6)	3 (1.4)
Technicians and associate professionals	14 (93.3)	1 (6.7)	13 (86.7)	2 (13.3)	15 (100)	0 (0.0)
Clerical support workers	20 (95.2)	1 (4.8)	20 (95.2)	1 (4.8)	21 (100)	0 (0.0)
Services and sales workers	146 (83.4)	29 (16.6)	144 (83.2)	29 (16.8)	163 (93.1)	12 (6.9)
Skilled agricultural, forestry and fishery workers	4 (66.7)	2 (33.3)	3 (60.0)	2 (40.0)	5 (83.3)	1 (16.7)
Craft and related trade workers	71 (85.5)	12 (14.5)	74 (91.4)	7 (8.6)	77 (92.80	6 (7.2)
Plant and machine operators	5 (83.3)	1 (16.7)	5 (100)	0 (0.0)	4 (66.7)	2 (33.3)
Elementary occupation	4 (80.0)	1 (20.0)	4 (80.0)	1 (20.0)	5 (100)	0 (0.0)
Unemployed	218 (90.5)	23 (9.5)	222 (92.1)	19 (7.9)	234 (97.1)	7 (2.9)
χ^2	10.143		16.807		28.134	
P value	0.428		0.079		0.002	

Table 4: Maternal occupations that predicted birth weight and still birth.

Variables	Low birth weight				Still birth			
	Odds ratio	P value	95% CI for odds ratio		Odds ratio	P value	95% CI for odds ratio	
			Lower	Upper			Lower	Upper
Armed forces	0.342	0.898	0.074	5.672	0.321	0.876	0.084	6.642
Managers	0.214	0.889	0.084	6.754	0.417	0.897	0.052	4.456
Professionals	1.138	0.702	0.586	2.212	0.473	0.283	0.121	1.853
Technicians and associate professionals	1.798	0.461	0.377	8.560	0.471	0.873	0.081	6.842
Clerical support workers	0.584	0.609	0.074	4.594	0.372	0.898	0.079	6.546
Services and sales workers	2.353	0.006	1.272	4.354	2.461	0.064	0.949	6.385
Skilled agricultural, forestry and fishery workers	7.789	0.030	1.225	49.516	6.686	0.102	0.687	65.028
Craft and related trade workers	1.105	0.829	0.447	2.734	2.605	0.094	0.850	7.987
Plant and machine operators	0.435	0.891	0.085	5.421	16.714	0.003	2.611	106.984
Elementary occupation	2.921	0.348	0.311	27.461	0.482	0.890	0.072	7.532
Unemployed	1				1			

DISCUSSION

The prevalence of preterm delivery varied broadly among the studied maternal occupational groups from 0.0% among the armed forces and managers to 33.3% among agricultural, forestry and fishery workers. This could be explained by heavier workload and more awkward postures, which have been shown to increase the risk of PD.[27] There is also epidemiologic evidence that exposure to pesticides typical for some agricultural jobs increases the risk of PD.[28,29]

A similar study conducted at a referral hospital in Tanzania reported that women involved in hard physical work during pregnancy had more than three folds increased odds of preterm delivery even after adjusting for the confounders.[30] This is consistent with other studies.[22,31,32] This high risk of preterm delivery in this group of workers may be explained by increased stress which triggers premature labour that leads to preterm delivery. The prevalence of PD among agricultural workers in this study was higher than the report of a similar study in Finland where 11% of agricultural workers had PD.[33] A report by the Royal college of physicians showed that there might be potentially increased risk of PD from prolonged standing at work and heavy physical work.[34] Also, another European study involving 17 countries showed a moderate excess risk of preterm birth observed for women working more than 42 hours a week, standing more than six hours a day, and having low job satisfaction.[35] However, another study found an increased risk of preterm delivery among non-employed women, particularly among women seeking employment.[7] This can be attributed to stress of unemployment and seeking for job and also shows that there are other factors that may cause PD. Our study also found out that mothers involved in elementary occupations like assistants in food processing industries had high risk of PD. A similar study in Sweden reported similar finding.[36]

Agricultural and fishery workers had the highest prevalence of LBW (40.0%) among all the studied occupational groups. On logistic regression agricultural, forestry and fishery workers had about 8 times odds of having babies with low birth weight than the unemployed while elementary occupations (cleaners, labourers, food preparation assistants etc.) had about 3 times odds of having low birth weight babies than the unemployed. This could also be related to heavy physical load, such as lifting heavy weights, and awkward physical postures shown to be related to the risk of LBW.[2] A similar study in Finland reported that women working in farming and forestry occupations had a 2.86 odds of LBW when compared to housewives.[33] Also an American study showed that long working hours is associated with LBW.[37] Employment precarity was also reported to predict LBW.[21] Most of these agricultural workers and labourers have precarious employment and this may also explain the high rate of LBW among these group of women. This job precarity may lead to inconsistent access to resources which will eventually lead to LBW. Surprisingly office, non-manual workers like the associate professionals had 2 times odd of having LBW new-borns than the unemployed mothers. This could however, be explained by various chemical, physical, ergonomic and psychosocial factors, which may differ substantially within this category. For example, exposure to solvents and environmental tobacco smoke is likely to be more common among these women than among the unemployed. Interestingly, a similar study reported that the risk of LBW was higher among the new-borns of unemployed. This could be attributed to lack of financial power on the part of these women to take adequate care of themselves and eat good food during pregnancy leading to LBW.[33] This suggests that employment places a woman within a social network enabling her to receive substantial support, which is especially beneficial during pregnancy. The unemployed pregnant women hence lack this social support and are exposed to the stress associated with low finances. Still birth rate was highest among plant and machine operators and agricultural, fishery and forestry workers. When adjusted for other occupations plant and machine operators had 16.7 times more odds of having still birth when compared to the unemployed. Agricultural, fishery and forestry workers had 6.7 times odds of predicting still birth when compared to the unemployed. Plant and machine operators are prone to such occupational hazards as standing for long hours, shift work, extremes of heat and cold, and working in an extremely hot environment and these have been found to be risky during pregnancy and have been reported to be associated with an adverse outcome such as stillbirth.[26]

A study in China reported that maternal pesticide exposure, stress and exposure to organic solvents were risk factors for still birth.[38]

These can explain the increased odds of still birth among these groups of workers. In contrast a Nigerian study reported that unemployed women and housewives had the highest prevalence of stillbirth within the study period.[39] Employment is associated with financial empowerment and as such women who are gainfully engaged can afford to decide to use skilled attendant during antenatal and delivery period thus reducing their chances of having a stillbirth. Differences in the ability to access good quality obstetric services may be due to differences in maternal employment status as a pregnant woman with no occupation may not afford the cost of health services which may later result to home delivery and risk of still birth. A similar study in Northern Nigeria also reported similar finding.[40]

Limitations

Occupational histories of some of the mothers were not clearly stated in their cards. Some of the occupations stated on the ANC cards were ambiguous and their recoding according to the ISCO-08 may have introduced

a bias. However, the recoding was done as precisely as possible to overcome this challenge.

CONCLUSION

Current study was able to show a large variation in the prevalence of adverse pregnancy outcomes between the studied broad categories of maternal occupation. Occupations that involve awkward positions and standing for long hours like farming, fishery and forestry workers are more predisposing to adverse pregnancy outcomes.

Recommendations

Employment in pregnancy is associated with a reduction in the risk of adverse outcomes through financial empowerment for women however certain occupations may lead to adverse pregnancy outcomes and hence should be avoided while pregnant or replaced with less strenuous occupation. Women empowerment should be made a priority both at family and community levels to enable women to afford necessary care during pregnancy and delivery.

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