

ORIGINAL STUDY

The incidence of low birth weight and intrauterine growth restriction in relationship to maternal ethnicity and gestational age at birth – A PEARL study analysis from the State of Qatar

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ABSTRACT

Objective: To analyze the association between maternal ethnicity and gestational age with the incidence of low birth weight and intrauterine growth restriction.

Study Design: Prospective, analytic study

Methods: The study was conducted between March 14th and April 4th 2011 in Women's Hospital HMC. The data was ascertained from the delivery register of labor ward on daily basis using predesigned, structured questionnaire. Data was stratified according to the maternal ethnicity groups and gestational age at birth (term and preterm).

Results: The total deliveries during the study period were 890; 35.5% Qatari (*n* 316) and 64.5% non-Qatari (*n* 574). The incidence of LBW was 12.36% (*n* 110). The difference of LBW incidence between Qatari (13.6% *n* 43) and non-Qatari (11.67% *n* 67) groups was non significant (RR 1.17, 95% CI 0.82–1.67, *p* = 0.401). The same was between non-Qatari sub groups (*p* < 0.05). The incidence of IUGR was 6% (*n* 54; 49.09% of LBW). The incidence of IUGR between Qatari (5.7% *n* 18) and non-Qatari (6.27% *n* 36) groups was significant (RR 0.45, 95% CI 0.3–0.6 *p* > 0.05).

The incidence of LBW was 7.85% (*n* 60) in term babies and 39.68% (*n* 50) in preterm babies. The incidence of IUGR was 3.79% (*n* 29) in term babies and 19.84% (*n* 25) in preterm babies. Preterm babies had a five times higher risk of both being LBW (RR 5.05; 95%CI 3.65–6.99; *p* < 0.001) and IUGR (RR 5.23; 95% CI 3.17–8.62; *p* < 0.001).

Conclusion: The incidence of low birth weight is independent of maternal ethnicity in Qatar. However, the incidence of IUGR is significantly higher among the non-Qatari population. The relative risk of being LBW or IUGR is five times higher in preterm babies. Further in depth studies are indicated.

Keywords: low birth weight, intrauterine growth restriction, ethnicity, Qatar

Abbreviations: HMC, Hamad Medical Corporation, LBW, low birth weight, IUGR, Intrauterine Growth Restriction

INTRODUCTION

The association between birth weight and mortality is among the strongest seen in epidemiology.¹ Although birth weight alone may not be the cause of mortality, the association is robust.¹ Babies born with a birth weight < 2500 gram are classified as low birth weight (LBW). These babies are at higher risk of poor perinatal outcome, neonatal mortality and long-term cognitive and motor impairments.^{2,3} The lower the birth weight, the higher is the mortality and morbidity. The proportion LBW babies is widely used as an indicator for assessing the population at risk, and historical series exist for many countries.³ LBW can be attributed either to preterm birth (< 37 weeks) or intra uterine growth restrictions (birth weight less than 10th centile) or a combination of both. Numerous risk factors have been attributed to the incidence of LBW including parental ethnicity, genetic and chromosomal anomalies, preterm birth, socio-economic background, maternal nutrition, maternal illnesses and placental insufficiency.⁴⁻⁶

The state of Qatar has made tremendous improvement in maternal and child health care over the last two decades. Its current maternal, perinatal and neonatal mortality and morbidity rates are comparable with the developed world.⁷⁻¹¹ However, in spite of this remarkable progress, the incidence of LBW in Qatar remains constant at 8.3 – 9.5%.⁷ Qatar has a multiethnic population with 35% Qatari and 65% non-Qatari; the majority of which are from the Middle East, South Asia and South East Asia.¹² This heterogeneity provides a very good population sample to study genetic and ethnic correlates for any disease. We conducted the current study to analyze the association of maternal ethnicity and gestational age at birth with the incidence of low birth weight and intrauterine growth retardation (IUGR).

METHOD

Perinatal Neonatal Outcomes Research Study in the Arabian Gulf (PEARL Study) is Qatar's prospective National Perinatal Epidemiologic Research Study funded

by Qatar National Research Fund (grant # QNRF-NPRP-09-390-3-097, IRB approval protocol #9211/09). PEARL Study is a joint collaborative research project between Hamad Medical Corporation (HMC), Doha, Qatar and University of Gloucestershire, Gloucester, United Kingdom which was launched on January 1st 2011 with an aim to build a National Neonatal Perinatal Registry for Qatar called Q-Peri-Reg. The study also provides opportunities for research training at both undergraduate and postgraduate level. The present study was conducted by a medical student (ZMA), between March 14, 2011 and April 4, 2011 to fulfill the undergraduate research requirements of the Royal College of Physicians Ireland. The data was ascertained prospectively from the delivery register of labor ward Women's Hospital HMC on daily basis using predesigned, structured questionnaire by ZMA under supervision of Lead PI (SR) and Research Fellow (NA). The data was entered electronically into a pre-designed Microsoft Excel spreadsheet. 87% of births in Qatar take place in Women's Hospital: hence the sample collected is representative of obstetric profile in Qatar. All babies born live during the study period, including multiples, were included in the study. Stillbirth and abortions were excluded.

Low birth weight was defined as weight at birth < 2500 g, up to and including 2499 g, regardless of gestational age.¹³ The gestational age was recorded in order to determine IUGR which was defined as birth weight below the 10th percentile for the specific gestational age when plotted on a standard term and preterm growth chart. The gestational age at birth was classified as term (≥ 37 weeks) and preterm ($\leq 36^{+6}$ weeks).

The maternal nationalities were grouped by geographical regions in order to get a wider ethnic and geo-demographic observation on low-birth weight. The groups included Qataris (QA) and non-Qataris which was further subdivided into three core subgroups Africans (AF), Middle Easterners (ME), Asians (AS). Due to their small numbers the rest of all the nationalities were grouped together as others (O). The ME group did not include Qataris whereas the AS group did not contain Middle-Eastern countries.

Statistical Analysis

All statistical analysis was done using the SPSS version 18.0. Chi square test was used to calculate p-value (cut off < 0.05). Relative Risk with 95% confidence interval (CI) for difference in the incidence of LBW and IUGR for various ethnicities and gestational age groups was calculated.

RESULTS

The total births during the study period were 890 of which 316 (35.5%) were Qatari and 574 (64.5%)

Table 1. Low birth weight incidence in Qatari and Non-Qatari groups.

Ethnicity	Total birth	LBW n (%)	RR (95% CI)	p value
A. Comparative analysis Qatari versus non-Qatari				
Qatari	316	43 (13.6)	1.17 (0.82-1.67)	0.401
Non-Qatari	574	67 (11.67)	1	
B. Comparative analysis among non-Qatari groups				
Asian	188	28 (14.8)	1.18 (0.70-1.98)	0.535
African	145	17 (11.7)	0.87 (0.48-1.58)	0.655
Middle East*	164	22 (13.4)	1	
Other**	10	0		

* Reference group.

** Excluded from comparative analysis due to zero LBW.

were non-Qatari. They were all included in the study. The overall incidence of LBW was 12.36% (n 110). The incidence of LBW among the Qatari group was 13.6% (n 43) and 11.67% among non-Qatari group (n 67). The difference in the incidence of LBW between the two groups (Table 1A) was statistically non significant (RR 1.17, 95% CI 0.82-1.67, p = 0.401). Among the non-Qatari sub groups, the incidence of LBW was highest among the Asians followed by Middle Easterners and Africans (Table 1B). However, the difference in the incidence of LBW among non-Qatari sub groups was statistically non significant (p < 0.05). The total number of IUGR was 54, which is 49.09% of LBW. Among the IUGR, 18 (33.33%) were Qatari and 36 (66.67%) were non-Qatari. The overall incidence of IUGR was 6% with an incidence of 5.7% among Qatari and 6.27% among non-Qatari group (Table 2). The difference in the incidence of IUGR between Qatari and non-Qatari groups was significant (RR 0.45, 95% CI 0.3-0.6 p > 0.05).

Among the LBW babies (n 110), 60 (54.55%) were term babies (\geq 37 weeks) and 50 (45.45%) preterm (\leq 36⁺⁶ weeks) while among the IUGR (n 54), 29 (53.7%) were term and 25 (46.3%) were preterm. The incidence of LBW was 7.85% (n 60) among term babies and 39.68% (n 50) among preterm babies (Table 3). The risk of being low birth weight was five times higher among preterm babies as compared to term babies (RR 5.05; 95%CI 3.65-6.99; p < 0.001). The incidence of IUGR among

term babies was 3.79% (n 29) while the incidence was 19.84% (n 25) among preterm babies. The relative risk of being IUGR was five times higher among preterm babies (RR 5.23; 95% CI 3.17-8.62; p < 0.001) as compared to term babies (Table 3).

DISCUSSION

According to the 2009 annual health report published by Hamad Medical Corporation, the incidence of low birth weight in Qatar has ranged from 8 to 12% between 2005 and 2009.¹⁴ We have reported in our own recent publication that the incidence of LBW in Qatar has become static around 8.3 – 9.5%.⁷ The World Health Organization (WHO) in its report on LBW published in 2004 has given a LBW incidence of 10% in Qatar.¹⁵ These statistics indicate that, in spite of Qatar's recent socio-economic and healthcare boom, the incidence of low birth weight has been relatively constant over the last decade. The incidence of LBW in our current study (12.4%) has reconfirmed the continuity of the same pattern. This is in contrast to the neighboring United Arab Emirates where socio-economic development and health care investment has led to a remarkable 25% reduction in the incidence of LBW.¹⁶ The static high incidence of LBW in Qatar needs further in depth study. The available literature examining the effect of maternal ethnicity and nationality on incidence of low birth weight shows varied results with no general

Table 2. Incidence of IUGR in Qatari versus Non-Qatari group.

Ethnicity	Total birth	IUGR LBW n (%)	RR (95% CI)	p value
Qatari	316	18 (41.8)	0.45 (0.3-0.6)	0.03
Non-Qatari	574	36 (53.7)	1	–
Total	890	54 (49.1)	–	–

Table 3. Comparative analysis of the incidence of LBW and IUGR in term and preterm babies.

GA	n	LBW n (%)	RR (95% CI)	p value	IUGR	RR (95%CI) n (%)	p value
Term	764	60 (7.85%)*	1	<0.001	29 (3.79%)*	1	<0.001
Preterm	126	50 (39.68%)**	5.05 (3.65-6.99)		25 (19.84%)**	5.23 (3.17-8.62)	
Total	890	110 (12.36%)			54 (6%)		

*% of term babies.

**% of preterm babies.

consensus established. Recent statistical analysis conducted in the United States in 2008 highlight an increased incidence of low birth weight amongst non-Hispanic blacks when compared to other non-Hispanic and Hispanic populations.¹⁷ A recent study from Pakistan has also shown a correlation between maternal ethnicity and incidence of low birth weight when controlling for gestational age of less than 37 weeks.¹⁸ This was re-iterated by another study from Pakistan, which has reported a higher incidence of low birth weight babies among Afghan refugee mothers when compared to Pakistani mothers.¹⁹ In contrast, some other studies have shown that there was no observed association between maternal ethnicity or nationality and incidence of low birth weight. A study from Bahrain, which investigated several risk factors for low birth weight, has highlighted that the relationship between maternal nationality and incidence of low birth was not statistically significant.²⁰ Similar results were also shown by a study conducted in the United States, where the likelihood of non-Hispanic white mothers having low-birth weight babies was similar to that of non-Hispanic black mothers, directly conflicting with other similar studies.²¹ The results of our current study have also shown that the difference in the incidence of LBW among various ethnic groups in Qatar is statistically non-significant. This indicates that, variables other than maternal ethnicity are likely to have a more direct impact on the incidence of low birth-weight.

IUGR constitutes a significant proportion of LBW. Recent studies have shown an association between IUGR and maternal ethnicity. A study carried out in Boston²² highlighted that alongside toxemia of pregnancy and weight gain, maternal race is a likely risk factor for small for gestational age (SGA) babies; a term synonymous to IUGR. Moreover, a study in Auckland showed that Indian mothers were at higher risk of having SGA babies when compared with the general Auckland population.²³ The difference in the incidence of IUGR among socio-economically different countries has also been reported by WHO.⁴ Our study has confirmed the same. The incidence of IUGR among non-Qatari population is significantly higher ($p > 0.05$) as compared to the Qatari population.

More than 50% of LBW and IUGR in our study were term babies. This highlights the need for further genetic and environmental factors which limit fetal growth. Only 40% of preterm babies in our study's babies were LBW because the majority of preterm were born "near term" with a birth weight ≥ 2500 g. In addition the estimation of gestational age based on LMP \pm obstetric ultrasound may not be very accurate. Among the preterm babies in our cohort, 46% were IUGR (weight $> 10^{\text{th}}$ centile for the gestational age). This may be either due to over calculation of gestational age or a true failure of fetal growth. When we analyzed term and preterm as two parallel groups, the preterm babies, as compared to term babies, were five times at higher risk of both being LBW and IUGR ($p < 0.001$). The higher incidence of IUGR among non-Qatari population and among preterm babies raises the need for another in depth multi factorial cause effect analysis of IUGR in Qatar.

Our study has several limitations. We did not control for other potential influencing variables that could have altered the findings. We utilized maternal ethnicity as a blanket term, which included factors relating to genetics, socio-economic and cultural norms. For example, variables such as maternal age, nutritional status and morbidities, amongst others, were not controlled. Instead, they were assumed to be represented to different extent relative to the ethnicity of the mother. Therefore, our study could not conclusively disregard maternal ethnicity as a risk factor low birth weight and IUGR in Qatar.

There are multiple implications derived from this study, which are significant for the next step in reducing the incidence of low birth weight and IUGR in the State of Qatar. With regards to reducing the overall incidence of low birth weight, we need to further investigate the independent risk factors and re-analyze the correlation between maternal ethnicity and low birth weight while controlling for these risk factors. In contrast, the positive association between the incidence of IUGR and maternal ethnicity (Qatari versus non-Qatari) provides us strong grounds to specifically investigate the risk factors pertaining to maternal ethnicity. Ultimately, by identifying the relevant risk factors the PEARL study aims to establish a more targeted preventative strategy

to address low birth weight, including IUGR, within the specific ethnic groups.

SUMMARY

Maternal ethnicity has no independent significant association with the overall incidence of LBW in the State of Qatar. In contrast, maternal ethnicity has a significant association with the incidence of IUGR. Although more than 50% of LBW and IUGR are term babies, the preterm babies have a five times higher risk of being LBW and IUGR. Further studies of the association between maternal ethnicity and LBW, including IUGR, are indicated. These studies should include other independent and dependent variables potentially associated with LBW and IUGR.

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CONFLICT OF INTEREST

None declared.

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