CORRELATES OF LOW BIRTH WEIGHT AND EFFECTIVENESS OF KANGAROO MOTHER CARE FOR ITS MANAGEMENT: LESSONS LEARNED FROM A TERTIARY CARE HOSPITAL OF LAHORE, PAKISTAN

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ABSTRACT

The study focuses on socio-economic, demographic, biological, and obstetrical correlates of preterm birth and low birth weight of neonates. It also evaluates the effectiveness of Kangaroo Mother Care (KMC) as a low-cost approach to managing the issue of low birth weight. Data collected from Services Hospital; a tertiary hospital situated in Lahore, Pakistan has been utilized. Results showed that factors such as parents' education, working status, and wealth status, as well as the mothers' age, age of gestation, and parity and gravida, were associated with low birth weight. Evidence showed weight gain after using KMC with 5 to 10 days of skin-to-skin contact and exclusive breastfeeding, leading to better health and early discharge from the hospital. However, socio-economic factors were not only correlated with preterm and low birth weight but also a hurdle to using KMC. The study provides insights for policymakers and highlights the need to address socio-economic backwardness to improve neonatal health.

INTRODUCTION

Neonatal duration comprising of 28 days of life after birth is a high-risk period for the. This risk is higher on the first day and during the first week after birth, which is almost one-third of total deaths. Globally, on average the risk of dying during the first month was recorded as 18 deaths per 1000 births in 2021. Although the death rate shows a decreasing trend still there is an alarming situation because 2.3 million neonatal deaths were reported in 2021 all over the world.[1] The situation is even more deplorable in low-income countries of Sub-Saharan Africa and South Asia. Preterm babies, defined as those born before 37 gestational weeks have a higher risk of neonatal mortality. In addition to the risk of death, preterm babies are also at increased risk for various neurodevelopmental disorders such as hearing and visual impairments, learning disabilities, and physical vulnerabilities (Soleimani et al., 2014). Preterm babies have also a tendency to have metabolic syndrome and cardiovascular disease in adult life (Markopoulou et

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[1] https://data.unicef.org/topic/child-survival/neonatal-mortality/

al., 2019). Preterm birth is therefore associated with significant costs to health systems in future (Petrou et al., 2019) . A baby born with a weight of less than 2.5 kilograms is considered as low birth weight baby and preterm babies are generally born with low birth weight. Low birth weight (LBW) can also be attributed to various socio-economic, demographic, biological and obstetrical factors. It can be associated with socio-economic factors such as physical or nonphysical abuse of mothers, parity (Marimuthu et al., 2019), gravida (Nayak et al., 2023) lack of social and husband's support (Marimuthu et al., 2018), living in rural areas, complications of pregnancy (Alebel et al., 2019), race, ethnicity, low education and unemployment (De Maio et al., 2020), gestational age below 37 weeks, deficiency of iron (Asmare et al., 2018), and caesarean delivery (Su et al., 2017).

Kangaroo Mother Care (KMC) is considered as a low cost intervention to treat the issue of low birth weight (Watkins et al., 2018). KMC practices skin-to-skin contact of newborn babies with their mother, father or some blood relation for a specific time. This skin-to-skin contact helps to reduce the risk of infection and provides the initial warmth that a preterm baby needs naturally (Mustikawati, 2020). Exclusive breastfeeding is also used to ensure the nutritional needs of preterm LBW babies and is considered as the most important factor of KMC. Skin-to-skin contact also builds a strong psychological relationship between the newborn and the mother.

Pakistan has the highest neonatal mortality rate in South Asia which is 40.2 per 1000 live births [2]. This has a big social and economic cost for the country. This study analyses different socio-economic, demographic, biological and obstetrical correlates of preterm birth and low birth weight of neonates in Pakistan. The study also evaluates the effectiveness of KMC which can be a low-cost and effective intervention to treat the issue of LWB due to scarce resources, lack of trained staff, equipment, incubators and non-availability of sufficient funds in the country.

METHODOLOGY

Data used in the study is of 354 cases in which KMC was practiced in Services Hospital, Lahore, Pakistan during August, 2016 to March, 2018. The cases of fifteen babies were observed in the Gynecology and Pediatrics Departments of Services Hospital Lahore from 19th to 29th March, 2018. Data of the rest of the cases was taken from the hospital's record. Data consisting of weight of neonatal babies as well as different socio-economic, demographic, biological and obstetrical factors which could possibly be the correlates of LBW was collected for our analysis. The list of variables and their definition is presented in table 1. Data was analysed with the help of graphs, charts and t-test. The t-test uses a statistic known as the t-statistic to evaluate the difference between the means of two groups. It is widely used in different fields and can be used to compare means from different samples, different populations, and different treatments.

Table 1. Description of variables.

Variable	Description
Mother's Age	The age of the mother of the neonatal in years at the time of delivery.
Gravida	The number of pregnancies a woman has had. Any pregnancy including present pregnancy, regardless of duration and fetus. Thus twins, triplets and other multiple fetuses count as one pregnancy and one birth (Olds et al., 2004).

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[2] https://data.unicef.org/topic/child-survival/neonatal-mortality/

Parity	Parity is defined as the number of times that woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn.
Income of Household	Household's total monthly income in Pakistani Rupees earned from any source.
Mother's Education	Mother's Education measured as four categories i.e. Primary, Secondary, Bachelor and Master.
Father's Education	Father's Education measured as four categories i.e. Primary, Secondary, Bachelor and Master.
Mother's Employment Status	Mother's Employment Status measured as two categories i.e. employed or unemployed.
Gestational Age	Gestational age is measured in weeks from the first day of women's last menstrual cycle.
Baby's Weight on Delivery	Newborn's weight in kilograms (kgs) at the time of delivery. Considered as LBW if baby's weight is less than 2.5 kg.
Baby's Weight on Joining KMC	Newborn's weight in kgs at the time of admission in the KMC centre
Baby's Weight after KMC	Newborn's weight in kgs at the time of discharge from the hospital after KMC
KMC Days at Hospital	Duration of stay at KMC centre in days
Breastfeeding	Breastfeeding is divided into two categories. Exclusive Breast Feeding when baby is fed breastmilk only whereas Partial Breastfeeding when baby is fed with breastmilk along with some formula supplement.

RESULTS AND DISCUSSION

Table 2 given below contains the frequency distribution of our variables. Statistics provided in Table 2 as well as visualization of data from Figure 1 show that besides obstetrical factors, socio-economic factors are also important correlates of LBW deliveries. The highest number of preterm LBW babies are born to mothers between the ages of 18 and 28 years, with a maximum of two gravidities and parity, and with gestational age of less than 37 weeks.

Table 2. Frequency distribution.

Variable	Classification	N	%
Mother's Age	18-28	268	75.71
	29-40	86	24.29
Gravida	1-2	207	58.47
	3-4	122	43.46
	5-6	21	5.93
	7-8	4	1.13
Parity	1-2	217	61.30
	3-4	115	32.49
	5-6	21	5.93
	7-8	1	0,28
Income of Household	5000-15000	84	23.73
	15000-25000	129	36.44
	25000-35000	122	34.46
	35000-45000	19	5.37
Mother's Education	Primary	128	36.16
	Secondary	167	47.18

	Bachelor	53	14.97
	Master	6	1.69
Father's Education	Primary	78	22.03
	Secondary	197	55.65
	Bachelor	64	18.08
	Master	15	4.24
Mother's Employment Status	Not Employed	306	86.44
	Employed	48	13.56
Gestational Age	28-31	13	3.67
	32-34	120	33.90
	35-37	169	47.74
	38-40	52	14.69
Baby's Weight on Delivery	Up to 2 kgs	261	73.73
	Greater than 2 and up to 3 kgs	93	26.27
Baby's Weight on Joining KMC	Up to 2 kgs	255	72.03
	Greater than 2 and up to 3 kgs	99	27.97
Baby weight after KMC	Up to 2 kgs	220	62.15
	Greater than 2 and up to 3 kgs	134	37.85
KMC days at Hospital	Up to 5 days	264	74.58
	More than 5 and up to 10 days	90	25.42
Breastfeeding	Partial	5	1.41
	Exclusive	349	98.59

These findings are consistent with previous studies which have also identified these demographic and obstetrical factors as significant predictors of LBW preterm deliveries (Kenyhercz et al., 2022). Healthcare providers need to be aware of these demographic factors to identify high-risk pregnancies and provide appropriate prenatal care.

Education of the mother and father, the mother's working status, and the household's income are important in determining the likelihood of a low birth weight (LBW) deliveries. According to our data, 83% of the women who had low birth weight (LBW) births had a secondary education or lower, whereas 17% had a Bachelor's or Master's degree. The father's education also plays a significant role, although the mother's education is more crucial in preventing LBW deliveries. The study also revealed that working women have a lower risk of having premature LBW babies than nonworking mothers. This could be attributed to working mothers having access to better healthcare facilities, more resources, and employer assistance to ensure a safe pregnancy. LBW deliveries are more prevalent in low-income households compared to higher-income households.
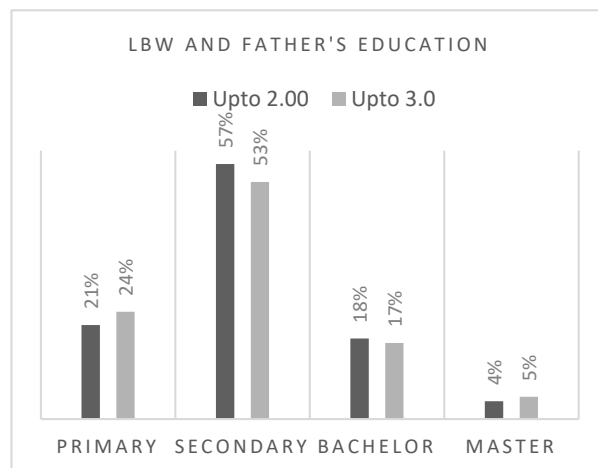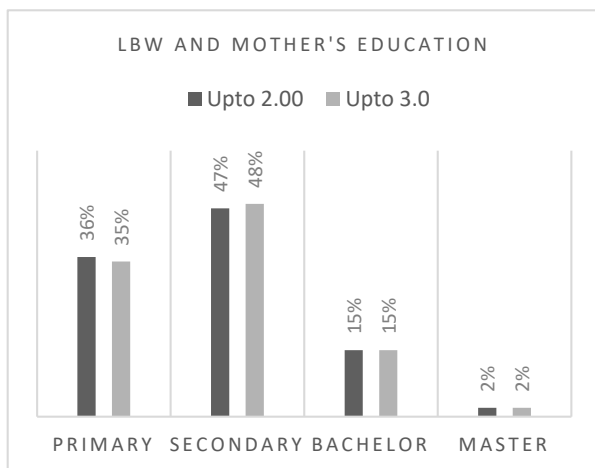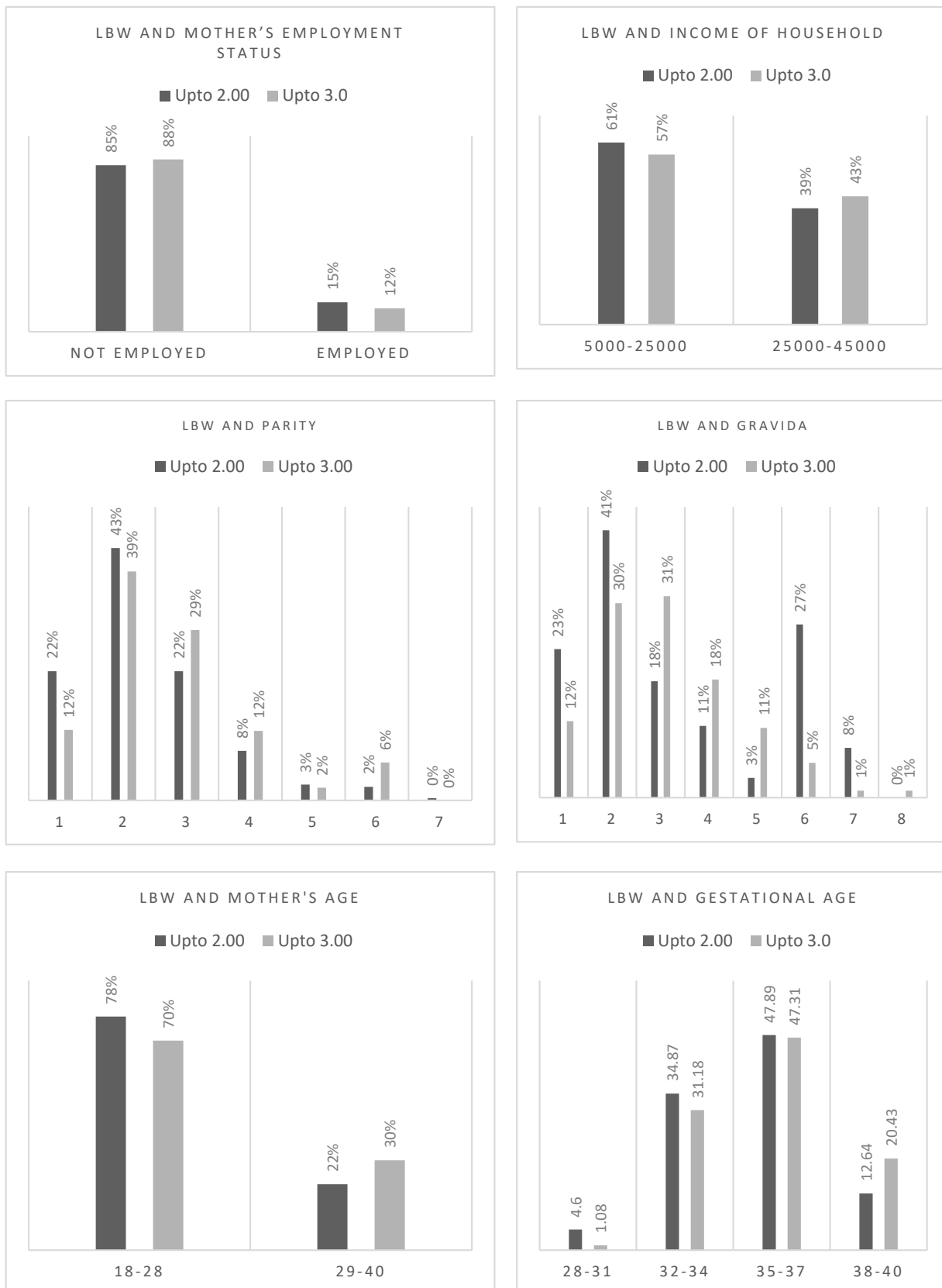
Figure 1. Low birth weight babies and socio-economic factors.

Additionally, the father's wealth significantly contributes to reducing the prevalence of LBW newborns. Higher levels of education and income for the mother also seem effective in reducing preterm LBW births.

Current research indicates that socioeconomic variables have a significant impact on the prevalence of LBW neonates. A major risk factor associated with premature LBW babies is the low education level of both the mother and father. The study conducted by Salam et al. (2022) found that working women had a lower risk of preterm LBW babies than non-working mothers. Previous research by Khan et al. (2020), which suggested that maternal employment was linked to better birth outcomes, further supports this evidence. Moreover, the prevention of LBW babies is significantly influenced by the father's affluence. According to a study by Charpak et al. (2021), a father's higher income was associated with a lower likelihood of LBW babies. Liang et al. (2020), also supported this idea, indicating that household income is a reliable predictor of birth weight. These findings suggest that improving socioeconomic status, including the mother's education, employment, and the father's income, can help reduce the rate of LBW births.

Interventions aimed at improving these socioeconomic factors could effectively reduce the burden of LBW while also enhancing the health outcomes of both mothers and children. Statistics indicate that newborn babies' weights improve after receiving Kangaroo Mother Care (KMC). Figure 2 and the t-test provided in Table 3 further confirm the effectiveness of KMC.

Figure 2. Low birth weight babies and KMC.

It is evident from Figure 2 that KMC is an effective intervention to treat LBW as weight gain was observed in 53% cases who stayed at the hospital for five days under KMC. Similarly, weight gain was noted in 52% cases after ten dys stay at the hospital under KMC programme.

Table 3. Paired t-test.

Variable	No.	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Baby's Weight after KMC	354	1.958387	.0143837	.2706272	1.930099	1.986675
Baby's Weight on Joining KMC	354	1.915113	.0153462	.2887361	1.884932	1.945294
Diff	354	.043274	.0091572	.1722911	.0252645	.0612835

mean(diff) = mean(Baby weight in kg after KMC -   Baby weight in kg on joining KMC)
t = 4.7257
Ho: mean(diff) = 0
degrees   of   freedom =   353

Ha: mean(diff) < 0	Ha: mean(diff) != 0	Ha: mean(diff) > 0
Pr(T < t) = 1.0000	Pr(T > t) = 0.0000	Pr(T > t) = 0.0000

The t-test provided in above table 3 shows that mean weight of babies after KMC is statistically significantly different from the mean weight of babies before KMC. It confirms that KMC can be used as an effective and low-cost intervention for the remedy of LBW. KMC involves skin-to-skin contact between the mother and the baby, which has been shown to regulate the baby's body temperature, improve breastfeeding rates, and lead to weight gain in preterm and low-weight infants (Mohammadi et al., 2022). KMC can be implemented in hospital settings or at home with support from healthcare professionals. Our result are in line with already existing studies which show that KMC was found to be effective in improving weight gain and reducing hospital stay in preterm infants when compared to conventional care (Narciso et al., 2022).

Furthermore, compared to conventional care, KMC administered in a hospital for 5 days has been demonstrated to dramatically raise weight in low birth weight infants (Narciso et al., 2022). Overall, KMC and exclusive breastfeeding are inexpensive as well as efficient interventions to enhance weight gain in low-weight infants.

CONCLUSIONS

According to our research, obstetrical, socioeconomic, and demographic factors, all significantly impact the development of low birth weight infants. Preterm births with low birth weights are primarily caused by various factors, including the mother's low education, her family's limited income, and her young age at delivery. Conversely, the mother's employment status and the father's higher income act as protective factors against LBW. Additionally, it has been established that Kangaroo Mother Care (KMC) and exclusive breastfeeding serve as low-cost interventions for preterm LBW neonates, promoting weight gain. Our research underscores the importance of public health initiatives that prioritize KMC and exclusive breastfeeding programs and address the socioeconomic and demographic factors influencing LBW. Based on our findings, we recommend prioritizing KMC and exclusive breastfeeding in public health efforts to enhance weight gain and support premature LBW babies. Raise awareness about the significance of parents' employment, education, and income in reducing the overall prevalence of LBW births. Implement prenatal care and prenatal education programs that promote healthy pregnancies, thereby reducing the proportion of LBW babies. However, our research has several limitations. Firstly, the study was initially confined to a single hospital, potentially limiting its generalizability. Secondly, our sample size was modest, possibly reducing the statistical power of our findings. Thirdly, we did not account for genetic and environmental factors that can impact LBW baby development. Lastly, our study relied on self-reported data, which is susceptible to recall bias. Future studies should address these issues and explore how other factors may affect newborns who are LBW.

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