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Survival of Newborn and Traditional Practices of Maternal and Neonatal Care- An Analytical Case-Control Study

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Abstract

Background

Pakistan has been reported to have the highest neonatal mortality rate of 39 (out of 1000 live births) among the South Asian countries. The disease burden in low- and middle-income nations is significantly influenced by financial restraints, delays in recognising danger signs, and socio-cultural factors. Most of these fatalities are avoidable. It is necessary to have a thorough understanding of cultural practices, beliefs, and family and societal norms to save precious lives. We have designed this study to determine the association between traditional practices of maternal and neonatal care and their effect on the survival of newborns.

Methodology

This is an analytical case-control study in which we utilise a non-probability consecutive sampling method. A total of 92 women (31 cases and 61 controls) who visited the outpatient departments of Paediatrics and Gynaecology/Obstetrics at Ziauddin Hospital, Kemari Campus, and lived in Gulshan-e Sikandarabad were chosen. The data were gathered through in-person interviews using a self-created, comprehensive, structured questionnaire with the assistance of community health workers. The data were collected from June 2021 to February 2022. The socio-demographics, maternal, neonatal, and neonatal care practices were the four main categories into which the variables under study were organized. The data was entered and analysed using IBM Statistical Package for Social Sciences version 20. Chi-square was used to compare appropriate practices between cases and controls. The odds ratios with a 95% interval were collected for all risk factors and effect modifiers by binary logistic regression. Multinomial logistic regression was used to determine the final predictors of the study. A p-value of ≤ 0.05 was considered statistically significant.

Results

On comparison of appropriate practices between cases and controls, significant associations were found between neonatal survival and the application of dressing on the umbilicus, time of first bath, cloth used for wrapping, exclusive breastfeeding, and getting the child vaccinated within the first week of life ($p < 0.05$). Multinomial logistic regression identified two factors of neonatal mortality. These factors were low birth weight (β 6.807,95% CI 1.77–26.10, $p = 0.005$), which increases the mortality ratio and vaccination of the child, which was found to have a protective effect (β 0.056,95%CI .011-.275, $p < 0.0001$).

Conclusion

Cultural practices were prevalent in the antenatal, natal, and post-natal periods, among which were found to be detrimental to neonatal survival. To achieve Sustainable Development Goal Target 3.2, it is high time to work at the grassroots level and create awareness for reducing newborn mortality by cutting down detrimental traditional practices.

1. BACKGROUND

The inception of Traditional Medicine dates back to ancient times, which is the entirety of proficiency unique to diverse cultures and employed in sustaining health, disease prevention, and treatment.(1). Traditions, societal norms, and cultural practices influence not only pregnancy and childbirth but also childbearing and women's autonomy over their own and their newborn's health(2). Even though cultural practices reflect common perceptions belonging to a certain society(3). These deeply ingrained cultural standards can be useful, detrimental, or have no impact on the health status of mother and child(4).

Worldwide, non-communicable diseases share a major burden of disease. From 1990 to 2021, ischemic heart disease, stroke, and chronic obstructive pulmonary disease were reported to be the leading causes of death, except for COVID-19 in 2020–2021, which caused a slight paradigm shift towards communicable diseases (5). Nonetheless, among the biggest drivers of fatalities in lower- and lower-middle-income nations continue to be transmissible illnesses, maternal, perinatal, and nutritional diseases (6). Over the past three decades, a notable global improvement in child survival rates has occurred. On a global scale, there is a yearly reduction in the rate of under-five mortality from 3.8% in 2000–2015 to 2.1% in 2015–2022 (7). A total of 4.9 million children under the age of five died in 2022 (7, 8), out of which 2.3 million children died in just the first month of their lives (8, 9). The rest of the 2.6 million deaths occurred between 01 and 59 months of life (8). The neonatal period spans the first 28 days of life after birth, and it is the most critical time for a child's survival (9). As the world historically advances from the Millennium Developmental Era, progressing towards achieving the Sustainable Development Goals (SDGs), Goal 3 ensures Good Health and Well-Being for all (10). As a sign of a commitment to protecting neonatal health, the worldwide target 3.2 of Sustainable Development Goal 3 (SDG3) has been established at 12 deaths per 1000 live births to halt preventable neonatal deaths and improve survival of neonates by 2030 (11). Given these efforts, the global neonatal mortality rate (per 1000 live births) has declined slowly from 36.8% in 1990 to 17.3% in 2022 (12). However, South Asia and Sub-Saharan Africa account for the greatest rates of newborn deaths in the world (9). According to the latest available data as of 2022, the neonatal mortality rate is reported to be highest in Pakistan among the South Asian countries of Afghanistan, India, Bangladesh, Bhutan, Nepal, Maldives, and Sri Lanka (13). Although the neonatal mortality rate (per 1000 live births) in Pakistan has improved by 64.9% deaths per 1000 live births from 104 in 1952 to 38.8 in 2022 (14), it is still concerning, as Pakistan falls short of achieving the global target of 12 deaths per 1000 live births or less by 20230 (11).

Neonatal infections, birth defects, asphyxia/trauma during birth, and premature birth are the top contributors that lead to early death for newborns (15) Most of which are preventable (16). Ignorance of neonatal danger signs (17). Cultural behaviours and beliefs of mothers regarding the care of their newborns are closely linked to the social characteristics of family type and faith, causing a potential obstacle to timely care-seeking (18).

A full understanding of social and community-based traditional maternal and newborn care practices is vital for the creation, execution, and sustainability of any successful program to promote healthy birthing and newborn care practices. We propose an alternative hypothesis that traditional practices of a society have a detrimental effect on the survival of a neonate, whereas the null hypothesis states that these practices do not have any impact on neonatal survival. Therefore, this study aims to explore social and cultural practices associated with neonatal and maternal care, which can lead to improvements in acceptable practices and provide relevant information for future programs and policy development aimed at reducing neonatal mortality effectively.

2. METHODS

Karachi is the largest metropolitan city in Pakistan and the 12th megacity in the world (19). As a financial hub, many people come here to seek employment, aiming for a better lifestyle, which has led to massive urbanisation. According to one study, Karachi has nearly 600 small, medium, to large informal settlements or slums (20). Gulshan e Sikandarabad is a small neighbourhood of Keamari town in Keamari District, one of the seven districts of Karachi, with a population of approximately 2 million, predominantly comprising an ethnic Pathan population (21–23).

An analytical case-control study was conducted in Gulshan-e-Sikandarabad, Karachi, Pakistan. In its vicinity is located Ziauddin Hospital, Keamari Campus. The target population of this study was mothers of newborns who delivered a baby between June 2021 and February 2022. The inclusion criteria included consenting adult married females, residents of Gulshan-e Sikandarabad who have delivered a child during the last six months and visiting the outpatient Paediatrics and Gynaecology/Obstetrics departments of Ziauddin Hospital, Kemari Campus between June 2021 and February 2022. The exclusion criteria were non-consenting adult married females, no births or stillbirths during the last 6 months, babies with any congenital abnormality, babies born beyond six months, and adopted babies. The sample size was determined based on a previous study that aimed to investigate the relationship between cultural practices and neonatal survival (24). It was calculated by the OpenEPI software based on the Kelsey formula. The calculation used the value of alpha = 0.05, power = 0.90, percent of controls exposed to late initiation of breastfeeding = 52.4, percent of cases exposed to late initiation of breastfeeding = 87.6, the ratio of controls to cases as 2:1, and an odds ratio of 2.03. The total calculated sample size is 92, including 31 cases and 61 controls. The case group consisted of a baby born alive during the last six months with no congenital abnormalities, but who has now passed away. The control group represented babies who were born alive during the last six months with no congenital abnormalities and are still thriving. The traditional practices of newborn care(25) consisted of hygiene during delivery (washing of hands before handling baby, cleanliness of the surface on which the mother was lying during delivery, cleanliness of cloth used to wrap the child after birth), instrument used for cutting the cord, keeping the baby warm, use of pre-lacteal feeds, initiation of breastfeeding time from birth to the time when breast milk was first given and immunization (the Bacillus Calmette-Guérin-BCG Vaccine, Oral Polio Vaccine-OPV 0,1,2,3, Pentavalent Vaccine 1,2,3, Rotavirus Vaccine 1,2, Pneumococcal Vaccine 1,2,3 and Injected Polio Vaccine-IPV given or not). An item score of “1” will be given to each right answer. The total sum of scores equal to or more than 12 was labelled as appropriate practice.

The ethical clearance was obtained from the Institutional Ethical Review Board of the Ziauddin Medical College (Reference No# 3460321BFCHS) before commencing the fieldwork. The community health workers of Ziauddin University, Kemari Campus, living in Gulshan-e-Sikandarabad, assisted in identifying the mothers and helped in conducting interviews with the participants in their native language after obtaining informed oral and written consent from them. Confounding was controlled by matching. The data collection was done through non-probability consecutive sampling. The data were collected from the participants who visited the outpatient departments of Gynaecology/Obstetrics and Paediatrics at Ziauddin Hospital, Kemari Campus, from June 2021 to February 2022. Data were collected using a self-designed structured questionnaire. The study variables were broadly divided into socio-demographics, neonatal factors, maternal factors, and neonatal care practices.

The data were entered and analysed using the International Business Machines Corporation (IBM) Statistical Package for Social Sciences version 20. Frequency and percentages were calculated for categorical variables like family structure, education, occupation, gender of the baby, birth interval, number of abortions, tetanus vaccination, antenatal visits, duration of pregnancy, mode of delivery, place of delivery, the person who assisted in the delivery, hand washing of the person conducting delivery, instrument used for cutting cord, when was the baby wrapped, cloth used for wrapping baby, when was baby given the first bath, giving of pre lacteal feed and its type, was colostrum given initiation of breastfeeding, exclusive breastfeeding, immunization, check-up of the baby by a physician and adequate practices. Mean and standard deviations were calculated for the numerical variables, such as age of the respondent and baby, number of family members, number of children under one year of age, and weight of the newborn. A comparison of appropriate practices between case and control was done using the Chi-Square test. The binary logistic regression analysis was done concerning all effect modifiers like age, gender, family structure, ethnicity, education and occupation. Crude and Adjusted Odds ratios with 95% confidence intervals were calculated to assess the association between outcome and risk factors. The multinomial logistic regression analysis was applied. The selection criteria for multivariate variables were those whose p-value was ≤ 0.025 in binary logistic regression analysis. A p-value of ≤ 0.05 was considered statistically significant. For reporting this study, guidelines from Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) were followed (additional file 1).

3. RESULTS

This study aimed to find any association between neonatal survival and traditional practices of newborn care. All the study variables were summarized by frequency and percentages as well as mean and standard deviation. The Chi-square, binary logistic, and multinomial logistic regression analysis were employed to fulfil the aim of the study. The findings are presented in two sections classified as descriptive statistics and analysis of the determinants of neonatal survival.

DESCRIPTIVE STATISTICS

The sample population of the study consisted of a total of 92 neonates, comprising 31 cases and 61 controls, delivered during the last six months. The study participant selection process is illustrated in the flow chart (Fig. 1). Firstly, we interviewed the respondents about their Socio-demographic characteristics.

The mean age of the respondents was 28.46 + 5.48 years. The neonates included in this study had a mean age of 14.13 + 7.49 days for cases and 3.331 + 1.93 months for controls. Most of the respondents were mothers, i.e., 89.1% (n = 82), followed by paternal aunts 4.3% (n = 4), maternal aunts 3.3% (n = 3), Father 1.1%(n = 1), and grandmothers 2.2%(n = 2). The family structure was nuclear in 39.1% (n = 36), joint in 37% (n = 34), and extended in 23.9% (n = 22) of the study population. The average number of individuals living in a household was 10.27 + 5.83. Of the 92 women interviewed, 84.8% (n = 78) were Pathans, 6.55% (n = 6) were Punjabi, 4.3% (n = 4) were Urdu-speaking, and 2.2% (n = 2) were Sindhi in ethnicity. About 2.2% (n = 2) belonged to the Balochi and other caste systems. When inquiring about the educational status of fathers, 38% (n = 35) had primary education, followed by 20.7%(n = 19) who had secondary, 5.4% (n = 5) were intermediate, 4.3% (n = 4) had a graduate degree, and 3.3%(n = 3) had Deeni Taleem (religious education), but unfortunately 28.3% (n = 26) had no formal education. Most mothers, i.e., 42.4% (n = 39), had no formal education; 30.4% (n = 28) had primary education,15.2% (n = 14) had secondary education,8.7%(n = 8) had Deeni Taleem (religious education), while 3.3%(n = 3) had completed intermediate-level studies. When asked about the father's occupation, 67.4% (n = 62) were private employees, 20.7% (n = 19) had a business, and 9.8% (n = 9) were government employees. Only 2.2% (n = 2) were jobless. Most of the mothers, i.e., 89.1% (n = 82), were homemakers, and just 10.9% (n = 10) were employed mostly as domestic helpers. The monthly family incomes were found to be very low. The income ranged between 11–15,000 Rs. in 54.3% (n = 50) of the study population, 25% (n = 23) had an income of 5–10,000 Rs. per month,10.9%(n = 10) earned 16–20,000 Rs. per month, and 9.8%(n = 9) had a monthly income of more than 20,000Rs. Regarding the gender of the newborn, the case group comprised 51.6% (n = 16) females and 48.4% (n = 15) males. The control group consisted of 54.1% (n = 33) males and 45.9% (n = 28) females.

The respondents were then interviewed regarding maternal factors that may have influenced the outcome. The gestational age was found to be full-term in 85.9% (n = 79) of the women, while only 14.1% (n = 13) reported preterm birth. On inquiring about any maternal illness during pregnancy, 33.7% (n = 31) responded affirmatively. High blood pressure was the commonest complaint, present in 38.7% (n = 12), followed by anaemia in 22.55% (n = 7) and gestational diabetes in 9.6% (n = 3) of women. On asking about the birth interval between the last two children, 54.3% (n = 50) had a birth interval of 2–4 years, 32.6% (n = 30) had an interval of < 2 years, 4.3%(n = 4) had an interval of more than 4 years, and 8.7%(n = 8) were primigravida. 38% (n = 35) of the women had a previous abortion, and out of those, 60% (n = 21) reported one abortion; 61% (n = 57) had no history of abortion

The reduction in maternal and neonatal mortality is highly dependent on antenatal care and services received by pregnant women from a trained birth attendant. In our study, 52.2% (n = 48) of women had antenatal visits; however, 43.75% (n = 21) of them visited a trained birth attendant only once during their pregnancy. Of those who visited for antenatal services, only 16.7% (n = 8) had the appropriate number of antenatal visits as per the World Health Organization (WHO) recommendation (26). 64.1% (n = 59) of the women received the recommended Tetanus vaccination, out of which 33.8% (n = 20) received the complete course, while the rest, i.e., 66.2% (n = 39), had received only one shot of vaccination.

The natal factors were significant in determining the outcomes of our study. We asked respondents about the place of birth of their baby. 31.5% (n = 29) of the women said they had delivered a baby in a Private Clinic, followed by the Private Hospital in 27.2% (n = 25) respondents, 22.8% (n = 21) of women delivered via home birth, and 18.5%(n = 17) had their delivery in a government healthcare facility. The delivery was conducted by doctors in 54.3% (n = 50), trained birth attendants in 22.8% (n = 21), by an elderly family member in 16.3% (n = 15), and by untrained Dai in 6.5%(n = 6). The majority of the women, i.e., 82.6% (n = 76), delivered normally by vaginal delivery, 12% (n = 11) had an operative delivery through Lower Segment Caesarean Section (LSCS), and 5.4%(n = 5) reported assisted delivery.

The respondents were then evaluated regarding essential newborn care practices, which may have had an impact on neonatal survival. The World Health Organization (WHO) has recommended certain steps which are essential for newborn care, including clean cutting of the cord, dry umbilical stump care, prevention of hypothermia by wrapping, delay in giving the first bath, and assessment of the baby by a health physician, etc (27, 28).

The very first enquiry was made about the hygiene status observed by the birth attendant, whether they washed their hands or not. To our surprise, (n = 8) did not observe cleanliness of their hands. Then, responses were gathered about the clean cutting of the cord, which was observed in 95.7% (n = 88) of the neonates, but the practice was found to be inadequate in 4.3% (n = 4) of the newborns. In this study, 52.2% (n = 48) of respondents applied something to the umbilical stump after cutting the cord. Mostly mustard and coconut oil were reported to be applied by women to their babies, 60%(n = 29). Hypothermia or decreased body temperature is a significant problem in neonates. According to this study, the baby was wrapped within 5 minutes in 66.3% (n = 61) of the respondents, while 33.7% (n = 31) did not follow this practice. Clean, new, or washed cloth was used for wrapping the baby in 88% (n = 81). The respondents were also asked about the time of the baby's first bath; it was observed that there was a recorded delay of at least 24 hours in only 26.4% (n = 24), while the rest 73.6% (n = 67) either did it very early (within an hour) or very late (after 3–10 days). The best practice in initiating the feeding of a newborn is to start breastfeeding within an hour after birth, to give colostrum, which is a thick yellowish milk formed during the first 5–7 days, and to avoid pre-lacteal feeding. In our target population, only 18.5% (n = 17) started breastfeeding within an hour. Colostrum was given to 69.6% (n = 64) of neonates. Exclusive breastfeeding was practised by 35.9% (n = 33) of mothers only. This study revealed that 58.2% (n = 53) of the respondents gave pre-lacteal feed to the newborn. The readymade "Guthi" available in the market was given to 41.5% (n = 22), followed by green tea given to 24.5% (n = 13) of neonates. The earliest possible assessment by a physician is also part of essential newborn care; 72.8% (n = 67) of newborns were examined within 24 hours of birth. Immunization is very useful in protecting neonates from fatal diseases. Most of the neonates, 77.2% (n = 71), were given their BCG vaccine and first dose of Oral Polio Vaccine (OPV) within a week of birth. Overall practices for maternal and newborn care were found to be adequate in 25.8% (n = 8) of cases as compared to 54.1% (n = 33) of controls. To assess the health-seeking behaviour of the target population, they were asked whom they consult in case of sickness. Most of the individuals, 93.5% (n = 86), chose the option of a doctor. The father of the baby was identified as the main decision-maker regarding health decisions in 54.3% (n = 50), followed by the mother-in-law in 18.5% (n = 17) of respondents.

ANALYSIS OF THE DETERMINANTS OF NEONATAL SURVIVAL

The comparison of appropriate practices between cases and controls was done by using the Chi-square test. The results were summed up and tabulated in Table 1. The cleanliness during the process of birth was assessed by asking whether the birth attendant washed their hands and what instrument was used

for cutting the cord. The variables yielded no statistically significant association (p = > 0.05). Then the respondents were asked about anything applied to the umbilical stump after cutting. A statistically significant association was found between the application of something on the umbilical stump and the survival status of the newborn (x^2 =6.61, p = 0.015). Newborn hypothermia prevention measures include covering the baby and postponing the first bath. The cleanliness of the cloth used to wrap the newborn after birth was also inquired about in this study. We found a statistically significant association between the survival of newborns and the time of the first bath, and the cleanliness of the cloth used for wrapping the baby (x^2 6.75, p = 0.01 and x^2 5.013, p = 0.03, respectively). However, the time of wrapping the baby did not show any significance in our study. The feeding practices were assessed by asking about pre-lacteal feed, initiation of breastfeeding, giving colostrum, and practice of exclusive breastfeeding. Only the practice of exclusive breastfeeding showed significant results in the survival status of newborns (x^2 5.54, p = 0.02). The variable of examination of the neonate by a physician showed no statistically significant association in our study, but getting the newborn vaccinated within a week after birth showed highly significant results (x^2 32.95, p < 0.0001).

The dependent variables of this study had a dichotomous outcome: neonatal death and survival. Therefore, the binary logistic regression method was employed to determine which of the independent variables are predictors of the outcome variable. The independent variables are categorized broadly as socio-demographic factors, neonatal factors, maternal factors, and neonatal care practices.

The socio-demographic factors included ethnicity, educational level of the father, occupation of the father and mother, type of family, number of individuals living in the same house, and monthly income. None of these factors showed any association with the state of neonatal survival. The results are summarized in Table 2.

The neonatal factors comprised the newborn's gender, birth weight and gestational age at delivery. Newborns with birth weight between 1.3–2.4 kg had 9.98 times higher odds of neonatal death as compared to babies whose birth weight was equal to or more than 2.5kg (OR = 9.98, 95% CI 3.67–27.13, p = < 0.0001). The chances of death were 5.82 times higher in preterm neonates as compared to full-term neonates (OR 5.82, 95%CI 1.62–20.89, p = 0.006). The gender of the newborn showed no significant association with the chances of survival. The findings are summed up in Table 3.

The maternal factors consisted of 10 variables which were maternal age, maternal education level, maternal illness, birth interval, antenatal care, Tetanus immunization, place of delivery, birth attendant, mode of delivery, and hygiene during delivery. Out of all these variables, maternal illness during pregnancy increased the odds of neonatal death by 3.2 times (OR 3.2, 95% CI 1.31–8.16, p = 0.01), Tetanus vaccination of the mother and hygiene observed during delivery showed a protective effect against neonatal death (OR 0.44, 95% CI 0.18–1.09, p = 0.07 and OR 0.26, 95% CI 0.05–1.21, p = 0.08 respectively). The rest of the variables showed no statistical significance. The results of maternal factors as obtained by regression analysis are tabulated in Table 4.

The neonatal care practices were evaluated using 10 items, which were instruments used for cord cutting, application of dressing on the umbilical stump, time taken for wrapping the baby after birth, time of first bath, pre-lacteal feed, initiation of breastfeeding, discarding colostrum, exclusive breastfeeding, examination of newborn by the doctor and vaccination status. The results showed chances of neonatal death were 3.29 times higher in those who had a dressing applied to the umbilical stump (OR 3.29, 95%CI 1.30–8.31, p = 0.01). The odds of newborn death were found to be 5.02 times higher in those who were given a bath immediately after birth (OR 5.02, 95%CI 1.36–18.5, p = 0.01). There were 3.30 times higher chances of death in babies who were not exclusively breastfed (OR, 3.30, 95%CI 1.18–9.2, p = 0.02). The vaccination of newborns within the first week of life showed a protective effect (OR 0.03, 95%CI 0.0096–0.145, p < 0.0001). The remaining variables did not show any significance in our study. The outcomes of the study variables are tabulated in Table 5.

The Multinomial logistic regression was applied to predict the final determinant of neonatal survival. A total of seven variables showed a statistically significant association in binary logistic regression. These included two neonatal factors, i.e., birth weight (p < 0.0001) and gestational age (p = 0.006), one maternal factor (maternal illness, p = 0.01), and four factors related to newborn care. The newborn care practices found to be associated were the application of dressing on the umbilical stump (p = 0.01), the time of the first bath (p = 0.01), the practice of exclusive breastfeeding (p = 0.02), and getting the newborn vaccinated (p = < 0.0001). The variables that showed a p-value of ≤ 0.025 in binary logistic regression were included in this analysis. Out of seven variables, only two were identified as predictors with a statistically significant p-value (< 0.05).

The babies born with low birth weight (< 2.5 kg) had 6 times the risk of neonatal death (OR 6.80, 95% CI 1.775–26.109, p= .005). The other predictor of neonatal survival identified was vaccination of the neonate within the first week of life. Getting the neonate vaccinated gave five times more protection against neonatal mortality (OR 0.056, 95% CI .011-.275, p = < 0.0001). The findings are summarised in Table 6.

4. DISCUSSION

This study explored the association between traditional maternal and neonatal care practices and newborn survival, revealing that despite considerable progress in reducing neonatal mortality globally, culturally rooted practices continue to be a major obstacle in improving newborn health outcomes in many parts of Asia. Cultural practices surrounding newborn care can significantly influence health outcomes—some offering protective benefits, while others may inadvertently increase risk. This study highlights the multifactorial nature of neonatal outcomes, emphasizing the roles of neonatal and maternal factors, along with culturally rooted newborn care practices. The main factors significantly associated with neonatal survival included neonatal vaccination, which was positively correlated with improved survival outcomes, and low birth weight, which markedly increased the odds of neonatal mortality.

While our findings provide valuable insights, they must be considered in light of certain limitations. Firstly, although we based our analysis on population-based data, the community studied predominantly consists of a particular ethnic group. This study may have overlooked some traditional practices that are common in other ethnic groups because of the differences in cultural practices among different ethnicities. Second, this research may have been more comprehensive if it had incorporated qualitative viewpoints on the trends in neonatal care practices. A third limitation is the potential recall bias inherent in collecting maternal and newborn care data from mothers who delivered within the past six months. Mothers of deceased newborns (cases) may recall

traditional practices differently from mothers of surviving newborns (controls). This differential recall, possibly influenced by guilt or social pressure, may have led to an overestimation of the association between traditional practices and neonatal outcomes.

The greatest strength of this study lies in its analytical case-control design, which enabled the identification of risk factors associated with neonatal survival. This approach provides robust evidence on factors influencing neonatal outcomes, allowing for more targeted public health interventions. The potential confounding factors were addressed through initial chi-square tests to identify associations, followed by adjustment using multivariable binary logistic regression, thereby minimising their impact on the observed associations. A notable strength of this study is its population-based design, utilizing primary data collected directly from the community, which enhances the accuracy and relevance of the findings. Furthermore, the study identifies critical areas requiring attention by the Maternal and Health Services Research Centre (MHSRC), donors, Non-Governmental Organizations (NGOs), and policymakers, providing actionable insights to improve newborn care practices and ultimately enhance neonatal health outcomes.

Our findings are consistent with, and add to, the existing body of evidence on factors influencing neonatal survival, while also highlighting some context-specific differences. Neonatal survival in our study was not substantially correlated with sociodemographic characteristics such as ethnicity, parental education, occupation, family type, household size, and monthly income. Most of our study participants, 54.3% (n = 50), belonged to a low socioeconomic status group. In contrast, other studies have shown a strong correlation between these variables and newborn mortality in similar settings (29–31). The absence of association in our study may reflect a relatively homogeneous sociodemographic profile or limitations in measurement accuracy. Moreover, consistent with the Mosley and Chen approach, proximate variables such as maternal health status, healthcare availability, and neonatal complications have a more direct influence on survival outcomes in this scenario(32). Mothers have a significant impact on neonatal outcomes, both biologically (such as maternal health, nutrition, and age) and socially (such as healthcare-seeking behaviour and awareness of infant danger signs. Despite controlling for other risk factors associated with neonatal mortality, maternal education continues to play a pivotal role in ensuring neonatal survival (33). In our study, the mothers of 51.6% (n = 16) neonates who didn't survive received no formal education, while 62.3% (n = 38) of the mothers were educated in controls. Although not statistically significant in our case but neonates born to mothers with higher levels of education tended to have better survival outcomes.

Out of all the maternal factors assessed in our study—including both prenatal and natal variables—only maternal illness showed a statistically significant association with neonatal survival in the binary logistic regression analysis ($p < 0.05$). The Global Maternal Sepsis Study (GLOSS) found that pre-existing medical problems and suspected or diagnosed infections during labour significantly increased perinatal fatalities in low- and middle-income countries(34). Preeclampsia and other hypertension disorders were linked to greater infant mortality in research by Khan et al., with preterm and delivery problems being the primary mechanisms(35). However, this association did not remain significant in the multinomial logistic regression model ($p = 0.199$), indicating that maternal illness was not an independent predictor of neonatal survival when adjusted for other covariates.

Following the assessment of maternal influences, it is equally important to consider neonatal factors, which have a direct and immediate impact on survival during the critical early days of life. Birth weight and gestational age at delivery are critical determinants of neonatal survival, morbidity, and nutritional status during both the neonatal and post-neonatal periods. The Ugandan study by Mubiri et al. (2020) provides strong evidence that very low birth weight and extreme prematurity are associated with dramatically higher neonatal mortality rates (36). According to a recent multicentre study that was carried out in 12 hospitals in Indonesia, infants with low birth weights (LBW) had the highest mortality rates, notably in the early neonatal period (37). Our study also identified low birth weight and preterm birth as strong and independent predictors of neonatal mortality. Specifically, newborns with a birth weight between 1.3 and 2.4 kg had 9.98 times higher odds of neonatal death compared to those weighing ≥ 2.5 kg (OR = 9.98; 95% CI: 3.67–27.13; $p < 0.0001$). Similarly, preterm neonates had 5.82 times higher odds of death compared to full-term neonates (OR = 5.82; 95% CI: 1.62–20.89; $p = 0.006$). While studies have reported higher neonatal mortality in males(38, 39). But our study yielded no significant gender disparity in mortality across the neonatal period. Neonatal survival is intricately shaped by the care newborns receive immediately after birth, and cultural norms play a decisive part in determining these practices. Importantly, harmful traditional practices, including giving a bath immediately after birth (OR 5.02, 95%CI 1.36–18.5, p = 0.01), applying unsterile substances or dressing to the umbilical stump (OR 3.29, 95%CI 1.30–8.31, p = 0.01), and not exclusively breastfed (OR, 3.30, 95%CI 1.18–9.2, p = 0.02), were associated with increased risk of neonatal death. This aligns with existing literature documenting the detrimental impact of such customs on neonatal health, particularly a systematic review by Priyadarshi et al. (2022) showed that babies showered within the first 24 hours had a higher risk of hypothermia compared with those whose baths were postponed beyond 24 hours(40). The WHO strongly advocates for delaying the newborn's first bath by at least 24 hours, a critical practice to preserve neonatal thermal regulation(28). A study done in Kenya showed that negligent umbilical cord care was linked to significantly higher risks of neonatal sepsis(41). Traditional substances such as Vaseline, oils, butter, cow dung, and herbal medicines were regularly administered to the umbilical cord, showing long-standing cultural customs(42). Isah et al. found similar results, highlighting the widespread use of indigenous therapies despite potential hazards(43). Across Pakistan, traditional and perhaps unsafe neonatal care methods are still widely used in both urban and rural areas. In Karachi, 86% of mothers reported bathing their newborns within the first 24 hours, and 74% of them used traditional items on the umbilical stump, including butter, turmeric, mustard oil, and coconut oil(44). Unhealthy cord practices were also observed in Peshawar(45). Similar behaviours were reported in rural Sindh, where 69% of mothers applied traditional remedies on the cord and 32% initiated early bathing(46). After cutting the cord, 52.2% (n = 48) of the respondents in our study applied something on the umbilical stump, primarily mustard and coconut oil were documented. The WHO recommends clean, dry cord care to be the gold standard for preventing neonatal infections, and it suggests the use of chlorhexidine in high-risk settings as an evidence-based strategy for lowering the burden of neonatal sepsis(28). Exclusive breastfeeding, recommended by the WHO from birth to six months, plays a crucial role in ensuring newborn survival(28). Evidence shows that exclusive breastfeeding (EBF) serves as a critical protective factor against infant morbidity and mortality, particularly from respiratory infections and gastrointestinal illnesses(47). Early initiation and EBF significantly lower the risk of neonatal infections and improves survival rates(48). However, the use of prelacteal feeds remains a common norm in many South Asian and Sub-Saharan African settings and is associated with delayed initiation, reduced rates of exclusive breastfeeding(49–52) Despite the reported benefits of EBF and its effects on the neonatal health status(53), suboptimal practices were prevalent, accounting for EBF in 35.9 % (n = 33) of mothers only. Immunization is a key approach strongly endorsed by the WHO for preventing neonatal infections(28) Considering the importance of immunization in improving newborn health and survival, the timely administration of these vaccines during the early neonatal period was linked to a significantly better outcome in reducing preventable mortality(54–57). Our finding support

existing literature, highlighting the importance of timely neonatal vaccination as a positive factor in improving survival outcomes in newborns (OR 0.056, 95% CI .011-.275, p = < 0.0001).

None of the other neonatal care practice variables had any significant correlation with newborn survival, indicating that their influence may be small or impacted by confounding variables.

Although a range of neonatal, maternal, and neonatal care practices revealed significant associations with neonatal survival in the unadjusted analysis, several of these effects attenuated after adjusting for potential confounding variables. To identify independent determinants of newborn survival, a multivariable logistic regression was performed. The analysis identified only two practices that yielded statistical significance. The LBW babies (< 2.5 kg) had 6 times more risk of neonatal death (OR 6.80, 95% CI 1.775–26.109, p= .005) while the other predictor of neonatal survival identified was vaccination of the neonate within the first week of life offering five times more protection against neonatal mortality (OR 0.056, 95% CI .011-.275, p = < 0.0001). These findings indicate that, of all the multiple factors, cultural and caring behaviours studied, these two interventions have the most robust and independent association with neonatal survival.

5. CONCLUSION

These results are particularly concerning given that such practices are deeply embedded within socio-cultural and religious traditions across South and Southeast Asia, influencing care at critical periods immediately after birth. Moreover, the persistence of these harmful cultural practices reflects broader systemic challenges. By quantifying the impact of these practices, our study not only fulfils its primary objective but also contributes to a growing regional evidence base emphasizing the complex interplay between cultural norms and neonatal survival. These findings highlight the pressing need for targeted interventions to improve vaccination coverage and address factors contributing to low birth weight to reduce preventable neonatal mortality. These insights underscore the need for culturally tailored health promotion strategies that engage communities respectfully, aiming to replace harmful traditions with evidence-based newborn care practices, thereby advancing neonatal health in low-resource Asian settings.

Abbreviations

Sustainable Development Goal (SDG), Bacillus Calmette-Guérin-BCG, Oral Polio Vaccine-OPV, Injected Polio Vaccine-IPV, World Health Organization (WHO), the Maternal and Health Services Research Centre (MHSRC), Non-Governmental Organizations (NGOs), low birth weights (LBW), exclusive breastfeeding (EBF)

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The permission to carry out this research study was obtained from the Institutional Ethical Review Board (IRB#3460321BFCHS) of the Ziauddin Medical College before commencing the fieldwork. With the assistance of community health workers, informed consent was read, and questions were asked of the participants in their native language after written consent. We strictly prohibited any sort of dishonesty by accurately capturing the data without any manipulation. Access to data was only available to the principal investigator.

CONSENT FOR PUBLICATION

Informed verbal and written consent were obtained from all the participants, and questions were asked in their native language with the help of community health workers. Complete confidentiality was maintained to keep the data discreet and not disclose the identity of subjects under any circumstances.

AVAILABILITY OF DATA AND MATERIALS

The datasets analysed in the study are obtained from vulnerable and conservative communities and therefore contain information subject to privacy and confidentiality restrictions. The datasets have been submitted to the journal for editorial review and will not be made publicly accessible to protect the privacy and confidentiality of the participating individuals. However, anonymized data will be accessible from the corresponding author upon reasonable request and are subject to privacy restrictions.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

The authors declare that this study was unfunded. The authors did not receive any sort of monetary compensation.

AUTHORS' CONTRIBUTIONS

BF conceptualized the study, collected the data, performed the data analysis and interpretation, and drafted the initial manuscript. GA and DT contributed to writing and critically editing the final version of the manuscript. SS helped in the preparation of the tables and drafting the manuscript. All the authors read and approved the final manuscript.

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Tables

Tables 1 to 6 are available in the Supplementary Files section.

Figures

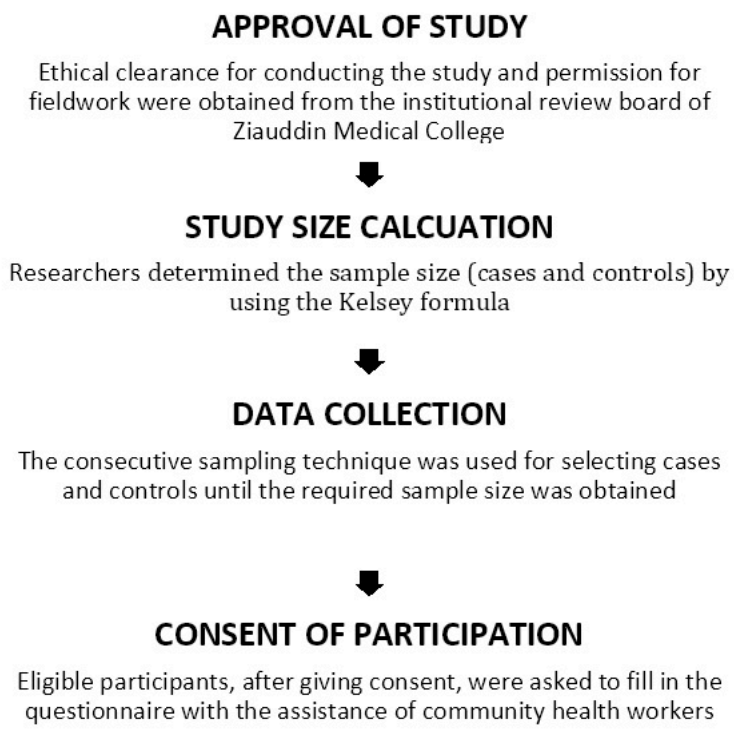


Figure 1

Flow Chart of Sampling Frame

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- TABLE1COMPARISONOFRESPONSESBETWEENCASEANDCONTROL.docx
- TABLE2REGRESSIONANALYSISOFSOCIODEMOGRAPHICFACTORSONNEONATALSURVIVAL.docx
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