Sultan Qaboos University Med J, November 2024, Vol. 24, Iss. 4, pp. 523–527, Epub. 27 Nov 24
Submitted 17 Apr 24
Revision Req. 28 May 24; Revision Recd. 13 Jun 24
Accepted 9 Jul 24
https://doi.org/10.18295/squmj.11.2024.070

CLINICAL & BASIC RESEARCH

Profile of Perinatal Infections Among Abandoned Neonates Admitted in a Tertiary Hospital in Oman

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abstract: ***Objectives:*** Little is known about the profile of perinatal infections among abandoned neonates, and there are no specific evidence-based guidelines on how to screen and manage these neonates. This study aimed to report the rate of perinatal infections among abandoned babies managed at Sultan Qaboos University Hospital (SQUH), Muscat, Oman, over 15 years (2006–2021). ***Methods:*** This retrospective cohort study included all abandoned babies admitted at SQUH from January 2006 to December 2021. Demographic data, the area where they were found, anthropometric parameters, symptoms, investigations and management were included in the study. ***Results:*** Of the 20 neonates included in this study, 11 (55%) were male and 9 (45%) were female; only 1 baby looked preterm. The estimated median age at admission was 1 day, while the median length of hospitalisation was 30 days. Infectious disease screening was not optimal for syphilis. Among the babies who were tested for perinatal infections such as HIV (n = 20), syphilis (n = 7), hepatitis B (n = 20) and hepatitis C (n = 19), none tested positive and all babies received the hepatitis B vaccine. Overall, 13 out of 20 babies received antibiotics for presumed sepsis. Zidovudine was given prophylactically to 3 neonates until the HIV test result was received. A total of 2 neonates were managed for gastroenteritis, 2 for sepsis and 1 for pneumonia; no death was recorded. ***Conclusion:*** A national protocol on what should be included in the screening and how to manage these babies is urgently needed to avoid adverse outcomes in this disadvantaged population.

Keywords: Perinatal; Infections; Abandoned; Neonates; Oman.

Advances in Knowledge

- *Little is known about the rate of perinatal infections among abandoned neonates in Oman.*
- *There are no specific evidence-based guidelines on what should be included in the screening and how to manage abandoned neonates.*
- *Among those babies who were tested for perinatal infections, including HIV, syphilis, hepatitis B and hepatitis C, none tested positive.*

Application to Patient Care

- *Syphilis screening was performed only for one-third of the patients in this study.*
- *Perinatal infections can be missed in abandoned neonates due to the lack of national management protocols on how to screen this population.*
- *A national screening and management guideline is urgently needed to reduce the risk of missing perinatal infections in this population.*

Child abandonment is a global public health and social issue with short- and long-term consequences.[1] For instance, in Texas, USA, 82 illegally abandoned neonates were reported between 1996 and 2006, an average of 7.5 per year. In China, the effect of the one-child policy since 1979 has resulted in increased infant abandonment, especially concerning female newborns.[1,2] In India, illegitimacy was the most common cause of abandonment among the 175 newborns reported between 1975 and 1976. In South Africa, approximately 3,500 newborns were abandoned in 2010.[3] In Kampala, Uganda, an estimated number of 40–80 infants are abandoned by their mothers annually.[4]

A wide spectrum of perinatal infections can affect newborns. Globally, approximately 90% of new infections among infants and young children occur through vertical transmission (i.e. mother-to-child).[5] Therefore, different antenatal screening protocols exist around the world to identify some preventable perinatal infections during pregnancy. Newborn screening for preventable perinatal infections is recommended, including screening for HIV, hepatitis B virus (HBV) and syphilis.[5] In Oman, pregnant women are screened for syphilis and HIV in their first antenatal visit.[6] However, it is impossible to determine if the mothers of these abandoned newborns received any prenatal care or not. Some of these newborns reach health institutions after a few days of life, where healthcare providers miss the opportunity to prevent vertically transmitted infections if they present.

Without intervention, approximately 20–45% of infants born to HIV-infected mothers may become infected with HIV, the risk of which can be reduced to less than 1% by implementing timely interventions.[6] According to reports from Africa, there is a high incidence of HIV infection among these newborns. For instance, a case study of abandoned newborns in

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Kenya showed that among 425 abandoned children, 45% were HIV positive.[7] Globally, AIDS resulted in around 13.2 million children being orphaned.[7]

In the context of India, infection was the most common cause of death among 175 abandoned babies in 1976.[3] Gastroenteritis followed by sepsis and bronchopneumonia were the main killers among the newborns who died. From 1997 to 2008, 11 newborns died in Denmark due to abandonment, with the majority being disposed of in plastic bags, with hypoxia, brain injuries or unknown causes of death.[8] No previous reports from Oman or the Middle Eastern countries assess the risk of acquiring perinatal infections in this population. Therefore, this study aimed to study the rate of perinatal infections among abandoned newborns managed at Sultan Qaboos University Hospital (SQUH), Muscat, Oman, over a period of 15 years and recommend a screening protocol for perinatal infections in this population.

Methods

This retrospective cohort study included of all abandoned newborns admitted to SQUH from January 2006 until December 2021. SQUH is one of the two main tertiary hospitals in Muscat, Oman. For this study, the demographic data, the area where the abandoned newborns were found, anthropometric parameters, symptoms and management-related information were extracted from the hospital information system and included in the analysis. The estimation of the gestational age was carried out by the neonatologists using the Ballard score. The primary outcome of this study was to detect the rate of perinatal infections among all abandoned newborns, while the secondary outcome was to provide data regarding the epidemiology, characteristics, clinical presentation and treatment provided to them. The screening for the risk of perinatal infections changed over time in the centre. The current screening includes HIV, syphilis, hepatitis C virus (HCV), toxoplasmosis, other agents, rubella, cytomegalovirus and herpes simplex (TORCH) and HBV serology.

Continuous variables were presented as median with an interquartile range and categorical variables as percentages for descriptive purposes.

Ethical approval was obtained for publication purposes from the Medical Research Ethics Committee (MREC) at Sultan Qaboos University.

Results

A total of 20 abandoned newborns were identified, comprising 11 (55%) males and 9 (45%) females. Only 1 newborn looked preterm (estimated age = 30 weeks of gestation). The estimated age at admission ranged from 1-day to 1-month-old and the estimated median age at admission was 1 day. The duration of their hospitalisation ranged from 4–140 days (median = 30 days). Their growth parameters were within the normal range for their estimated age. Of the newborns, 6 were found near the mosques [Table 1].

A TORCH screen was performed on only 7 newborns (35%), and none of them were reactive. The HIV serology screen was non-reactive in all 20 newborns. HIV-1 RNA testing was performed for 7 newborns, with the results being negative. Hepatitis B surface antigen was non-reactive in all 20 newborns, and a syphilis screening immunoassay was performed on 7 newborns, with the results being non-reactive in all. A total of 19 newborns had negative screens for hepatitis C antibodies. There were 2 neonates who were managed for sepsis and 1 for lower respiratory

Table 1: Demographics, infectious disease work-up and management provided for the abandoned newborns (N = 20)

Variable	n (%)
Gender	
Male	11 (55)
Female	9 (45)
Estimated gestational age group	
Term	19 (95)
Pre-term	1 (5)
Area where the neonate was found	
Near house	3 (15)
Near mosque	6 (30)
Hospital	3 (15)
Other	8 (40)
Infectious diseases work-up	
HIV Ag/Ab screen	20 tested: Non-reactive
HIV-1 RNA	7 tested: Not detected
HBsAg	20 tested: Non-reactive
Hepatitis C antibody	19 tested: Non-reactive
Syphilis screen	7 tested: Non-reactive
Blood culture	17 tested: Negative
Urine culture	7 tested: Negative
Management	
Respiratory support	2 (10)
Intravenous fluid bolus	2 (10)
Antibiotics	13 (65)
Hepatitis B vaccine	20 (100)
Hepatitis B immunoglobulin	11 (55)
HIV prophylaxis (zidovudine monotherapy)	3 (15)

HBsAg = hepatitis B surface antigen.

Table 2: Initial management protocol proposal for abandoned newborns to prevent perinatal infections

Perinatal infection	Initial screening test	Management
HBV	HBsAg and anti-HBc	- If HBsAg and anti-HBc non-reactive ⟶ Hep B vaccine at 0, 2, 4 and 6 months of age. - HBsAg is non-reactive and anti-HBc is reactive ⟶ Hep B vaccine (0, 2, 4, 6) + HBIG within 7 days of life. - Post-vaccination testing for anti-HBs and HBsAg at 9–12 months of age ⟶ if tested reactive for HBsAg, refer to a hepatologist for further management.
HCV	HCV antibody (anti-HCV)	- If anti-HCV is non-reactive: no action is needed. - If anti-HCV is reactive, check HCV RNA at 3 months of age, if detected, refer to a hepatologist or infectious diseases consultant to provide extra testing and follow-up. Repeat anti-HCV at 12 months of age, if non-reactive ⟶ discharge.
Syphilis	Syphilis serology screen (immunoassay for detection of *Treponema pallidum* antibodies)	If the screen is non-reactive ⟶ no additional testing is required. If the syphilis screen is reactive: 1) RPR and TPHA will be tested. 2) Refer to the infectious diseases team to evaluate for congenital syphilis infection. 3) Test for syphilis IgM to confirm status. 4) A reactive syphilis screening could be due to passive maternal antibodies. Advise repeat syphilis screen at intervals of 3 months to monitor for changes in titres, or until tests become non-reactive (seroreversion).
HIV	HIV Ag/Ab	- Test results should be available within 4 hours of admission. If a delay is expected, the newborn should be started on presumptive HIV therapy, which includes 3 drug regimen: zidovudine, lamivudine and raltegravir – consult an infectious diseases consultant for choices and doses. - Infant ARV drugs should be discontinued immediately if HIV serology is non-reactive. - If the HIV screen is reactive, send for HIV PCR testing. If confirmed, to be referred to the infectious diseases team for further management

HBV = hepatitis B virus; HBsAg = hepatitis B surface antigen; anti-HBc = total antibody to hepatitis B core antigen; HBIG = hepatitis B immune globulin; HCV = hepatitis C virus; RPR = rapid plasma regain; TPHA = treponema pallidum haemagglutination; Ag = antigen; Ab = antibody; ARV = antiretroviral; PCR = polymerase chain reaction.

tract infection. Furthermore, 2 were also managed with hydration for viral gastroenteritis. Blood and urine cultures were performed for 17 and 7 newborns, respectively, and all results were negative.

Only 2 newborns required respiratory support, 1 of them being a preterm newborn. A bolus of normal saline was given to 2 neonates on arrival. All newborns received the hepatitis B vaccine and 11 received the hepatitis B immunoglobulins. Antibiotics were administered to 13 newborns, 9 of whom received ampicillin and gentamicin, while the remaining 4 received cefotaxime. Only 3 newborns received zidovudine prophylaxis until an HIV test could be performed. All newborns did well, and there were no mortalities reported in this population.

Discussion

Most of the abandoned newborns in this study were left near mosques (30%). Generally, there is a constant presence of people around mosques and the newborns could have been left there with the assumption that they taken to stakeholders. In Kampala, Uganda, it was found that some women abandoned their newborns at hospitals or the gates of children's homes, while others discarded them on the streets or in pit toilets, leaving them to die.[4]

Many pregnant women in Africa and Asia do not receive adequate prenatal care during pregnancy.[9] However, in Oman, all pregnant women are screened for syphilis and HIV in their first antenatal visit; in the current study, there was no way to confirm whether this screening was performed on the mothers.[6] In the current study, the assumption was that most of the abandoned newborns' mothers did not receive any antenatal care or screening for HIV or syphilis; this assumption was made to err on the side of caution for the sake of the newborn.

The current study constitutes the first report describing the rate of perinatal infections among abandoned newborns in the Middle East region. During the study period, no single perinatal infection was found in the abandoned newborns. The HIV epidemic in Oman has remained low in prevalence, with a recent study in Oman reporting a 1% mother-to-child HIV transmission rate.[10] In this study, none of the abandoned newborns showed reactive HIV serology or HIV RNA results. According to a 2009

study conducted in Russia, approximately 20% of abandoned infants were born to HIV-infected mothers.[11] In 2017, a study from Togo found that 43% of abandoned infants were HIV serology reactive; approximately 3 out of 4 children who had reactive HIV serology at admission were abandoned.[12] A 2011 study carried out by Oladokun and Brown in South Western Nigeria found that 41.6% of infants enrolled in the study were abandoned, while 1.3% were found to be HIV reactive.[13]

Estimates place Oman's chronic HBV prevalence between 2–7%.[14] None of the newborns in the current study had a reactive hepatitis B profile. Although the hepatitis B vaccine was given to all newborns based on the Ministry of Health immunisation schedule, only half of them (55%) received hepatitis B immunoglobulin with no apparent documented reasons.

Congenital syphilis affects newborns more than any other congenital infection and carries a high risk for morbidity and mortality for newborns.[5] To the best of the authors' knowledge, no other study in the global context has examined the rate of congenital syphilis infections among abandoned newborns. In this study, only one-third of neonates were screened for congenital syphilis, which is not optimal, but all newborns were non-reactive. Furthermore, only 2 newborns were managed for gastroenteritis and 3 for severe bacterial infections (2 with sepsis and 1 with pneumonia), and no death was recorded compared to the study by Lokeshwar *et al*., which reported multiple deaths of newborns due to gastroenteritis followed by sepsis and bronchopneumonia.[3]

The management of abandoned newborns in this study was not standardised due to a lack of local policy and protocol. In addition, syphilis screening was performed for one-third of the cohort. Therefore, this study proposes a screening protocol for these newborns to ensure that all the required screening tests and prophylaxis are carried out promptly to avoid administering unnecessary medications [Table 2].[15–18]

The study was subject to certain limitations. The patients were from a single centre, there was a small sample size and there was missing data. Therefore, this study does not necessarily represent Oman in its entirety. Thus, a multicentre study in the context of Oman will help address these limitations in the future.

Conclusion

Abandonment is an existing critical social and public health problem that needs a standardised national policy and management protocol to ease the prevention of unwanted outcomes such as perinatal infections. Local and regional multicentre studies are needed to examine the extent of abandonment in Oman and the Gulf region, along with its social and health impacts.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

FUNDING

No funding was received for this study.

AUTHORS' CONTRIBUTION

LAY played a key role in the project from its inception. She was responsible for writing the proposal, obtaining ethical approval, analysing data and revising the manuscript. NAS provided valuable support by assisting with data collection and revising the manuscript. TA contributed significantly to the project by assisting with data analysis and writing the first draft of the manuscript. KAM, FAF and MA helped with proposing the screening guidelines, laboratory testing and revising the manuscript. All authors approved the final version of the manuscript.

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