

Prevalence of Sepsis and Possible Severe Bacterial Infection among Neonates in Nepal

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ABSTRACT

Nepal lacks adequate data on the prevalence of sepsis and Possible Severe Bacterial Infection (PSBI) among neonates. Thus, this systematic review was designed to estimate the prevalence of neonatal sepsis and PSBI status in Nepal. We searched PubMed and Nepal Journal Online for relevant studies on PSBI and neonatal sepsis published from 2006 to 2016. The eligibility criteria included those studies done in Nepal, evaluating the prevalence of PSBI/neonatal sepsis with denominators as the population at risk that is either total live births or total cases evaluated. Altogether, four studies met the review criteria, out of which three were hospital-based and one community-based. There is a vast difference in prevalence rate between hospital-based (2-4%) and community-based (9%) studies. Two studies used haematological scoring system and blood culture to base their diagnosis; one used signs and symptoms for PSBI while the other did not mention the diagnostic criteria. This systematic review suggests that though neonatal sepsis poses a big problem, it lacks a significant number of related studies. There is a need to conduct a nationwide survey on the prevalence of sepsis and PSBI among neonates, which will help to develop health policy.

Keywords: Nepal; neonates; possible severe bacterial infection; sepsis.

INTRODUCTION

Infection is the most common cause of neonatal mortality worldwide.¹⁻⁶ Possible Severe Bacterial Infection (PSBI) is a clinical syndrome used in the Integrated Management of Neonatal and Childhood Illness (IMNCI) package referring to a sick young infant who requires urgent referral to hospital.⁷ Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.⁸ Clinical algorithms have been developed in Nepal to direct the treatment of neonates and young children identified with PSBI as in the WHO guidelines of the Integrated Management of Childhood Illness.^{9, 10}

After a decade of struggle, the neonatal mortality has declined from 33 to 21 deaths per 1000 live births in Nepal as reported in the most recent Nepal Demographic Health Survey 2016 (NDHS).¹¹ WHO's Every Newborn Action Plan (ENAP) sets a target of 10 or fewer neonatal deaths per 1000 live birth in every country by 2035.¹² Nepal is committed to achieving this target and has set up some strategies such as the upgrade of government hospitals, implementation of free newborn care services and development of training materials and capacity building of health workers.^{13, 14}

This study aimed to review the literature available to find out the prevalence of PSBI and/or neonatal sepsis which will help the policy makers to make appropriate plans and policy for the prevention and management of the newborn with infection.

METHODS

For the purpose of this systematic review, a comprehensive literature search using the search engines PUBMED and Nepal Journal Online (NEPJOL) was performed. Keywords used in the search included "possible severe bacterial infection" AND "newborn/neonates" AND "Nepal", "possible severe bacterial infection among newborn in Nepal", "neonatal sepsis" AND "Nepal", "neonatal sepsis in Nepal", "neonat* sepsis" AND "Nepal". For uniformity in hospital-based and community-based studies, PSBI cases of only neonates (0-28days) were included.

Any empirical study that explored PSBI or neonatal sepsis in Nepal was considered for possible inclusion in the review. The inclusion criteria in this review were: studies have to be (a) conducted during the period 2006-2016, and (b) a denominator for the population at risk had to be available as a total number of live births or

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total cases evaluated. We did not exclude studies on the basis of their method of case ascertainment.

Two reviewers (GS and RM) independently searched for the titles and abstracts and selected the studies that were relevant. Both reviewers read the titles, abstracts and full texts of the selected studies to verify that they matched the inclusion criteria. Any disagreement among the two reviewers was resolved through discussion and the final decision to be included in the study was taken by the third reviewer (PRS).

Community-based studies diagnosed PSBI on the basis of signs and symptoms and hospital-based studies diagnosed neonatal sepsis on the basis of signs and symptoms as well as investigations. Hence, the studies were categorised as community and hospital-based. We initially planned to find out the risk factors for neonatal sepsis/PSBI cases but most of the studies were descriptive in nature and very few studies have analysed risk factors, thus we had to limit ourselves to prevalence study.

The protocol of this systematic review was registered at PROSPERO on 17 May 2017. The registration number for this review is CRD42017065996 available from [\[Link\]](#)

RESULTS

The initial search resulted in the identification of a total of 107 potentially relevant studies. Review of the titles and abstracts of identified articles resulted in the selection of 32 studies that met the inclusion criteria. The full text was retrieved for all of these 32 articles

and two independent reviewers read these articles to determine suitability for inclusion. This review resulted in narrowing the set of articles down to four (Figure 1).

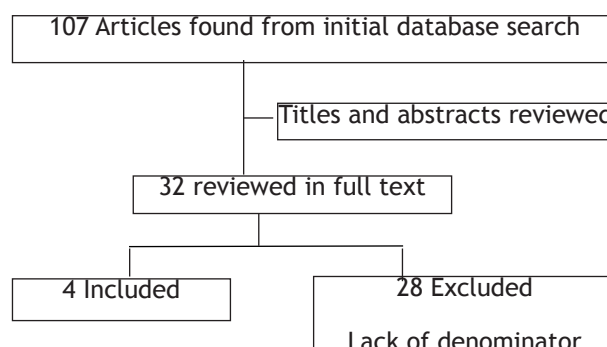


Figure 1. Flowchart of the studies identified and the process of selection of the studies.

All the four studies included in the review were of cross-sectional design. Two studies have unclear denominators. However, due to a scant number of studies that fit in this review we have to include them.

Among four studies, three were hospital-based viz. Paropakar Maternity and Women's Hospital (Kathmandu), Nepal Medical College (Kathmandu) and Patan Hospital (Patan).¹⁵⁻¹⁷ One study was community-based and was conducted in Morang district.¹⁸ Two studies used haematological scoring system and blood culture to base their diagnosis; one used signs and symptoms for PSBI according to MINI algorithms while one study did not mention the diagnostic criteria (Table 1).

Table 1. Details of each study included in the review.

Authors	Study site	Study sample	Diagnosis	Period of data collection	Study type	Prevalence of sepsis/PSBI	Significant risk factors if identified
Thapa B et al. (2013)	Paropakar Maternity and Women's Hospital, Kathmandu	4394 deliveries with 186 neonatal sepsis	Haematological scoring system	Oct - Dec 2011	Hospital based	4.23%	Cesarean section, Apgar score <4 at 1 min and <7 at 5 min of birth (p=0.001) predicted sepsis.
Sharma A et al. (2011)	Nepal Medical College, Kathmandu	793 deliveries with 26 neonatal sepsis	Not mentioned	April 2008- April 2009	Hospital based	3.28%	-
Khanal S et al. (2011)	Morang District	11457 live births with 1051 PSBI cases	MINI algorithms	May 2005- April 2007	Community-based	9.17%	-
Shrestha S et al. (2010)	Patan Hospital, Patan	7117 live births with 161 neonatal sepsis	Blood culture	Nov. 2006-Nov 2007	Hospital based	2.26%	-

We cannot ascertain the denominators mentioned in the hospital-based studies where live births were mentioned for the particular studies because the number of neonates that were admitted due to referral was not mentioned in the articles. Except in study by Thapa B et al. none of the studies have further analysed the association between the neonatal sepsis/PSBI and risk factors.¹⁶ The prevalence of neonatal sepsis in hospital-based studies ranged from 2.3% to 4.2% with least prevalence in Patan Hospital followed by Nepal Medical College and highest in Paropakar Maternity and Women's Hospital. The prevalence of PSBI in the community-based study was 9.2% (Table 1).

DISCUSSION

The review found that a small number of studies have been conducted on the true prevalence of Neonatal sepsis and PSBI in Nepal. The prevalence of neonatal sepsis in the hospital-based study ranged from 2.3% to 4.2% and the prevalence of PSBI in the community-based study was 9.2%.

As mentioned previously, most studies explored blood culture-proven neonatal sepsis among the suspected neonates which did not give the true prevalence of the morbidity. However, it is important to note that the prevalence of culture-proven neonatal sepsis among the suspected neonates is very high in Nepal ranging from 15% to as high as more than 50%.¹⁹⁻²³ In a systemic review done to estimate possible severe bacterial infection in neonates in Sub-Saharan Africa, South Asia, and Latin America for 2012, the pooled estimate of PSBI incidence risk was 7.6% (95% CI 6.1-9.2%).²⁴

Neonatal infections, the single largest cause of neonatal mortality globally, is preventable with existing evidence-based, cost-effective interventions.²⁵⁻²⁷ Simple interventions such as hand washing and limiting the number of visitors handling the neonates can reduce significant proportion of PSBI/ neonatal sepsis.²⁸⁻³² Prevention of maternal infections (tetanus toxoid vaccination), neonatal infections (Clean delivery and Chlorhexidine gel application to cord after delivery), early breastfeeding, early recognition of illness, and appropriate management of PSBI and neonatal sepsis are essential to reduce neonatal mortality and long-term disability.³³⁻³⁶

It is interesting to note the wide variation in community and hospital reported prevalence of PSBI and neonatal sepsis in the studies reviewed. This could be due to variations in the aims and objectives of the studies, diagnostic criteria and in sample selection procedures,

the types of samples studied, instruments and questionnaires used for data collection. The articles included in this review were very less, hence it may not be generalised to the whole country. It is also possible that some studies, which were published in journals not indexed in PUBMED and NEPJOL, could not be identified.

The present review is the only attempt that has so far been made to find out the true prevalence of sepsis and PSBI among neonates in Nepal. This review provides useful information about the quality and quantity of studies conducted on this issue in Nepal and may help to identify further areas for research in this field.

CONCLUSIONS

From this review, it is clear that to date very few studies have been conducted attempting to find out the true prevalence of sepsis and PSBI among the general population in Nepal. There is a need to conduct a nationwide survey on the prevalence of sepsis and PSBI among neonates and compare within and outside countries, which may help to evaluate health system performance and make appropriate health policy. There is also an urgent need to seek for the risk factors and test the intervention for the benefit of the sick neonates so as to achieve the Nepal ENAP goal.

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