

# Challenges in the Management of Sepsis in a Resource-Poor Setting

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## Abstract

**Background:** Sepsis is a deleterious host reaction to microorganism and can lead to high mortality rate. Early recognition and prompt treatment increases the chances of survival. **Objective:** To outline the challenges in the management of sepsis in a resource limited setting and make appropriate recommendations. **Methodology:** The data was collected through an online literature search for cases of sepsis managed in resource limited settings from 1990 to 2015. Search terms used included: “sepsis”, “septicaemia”, “incidence”, “prevalence”, “morbidity”, “mortality” and “management challenges” using the English and American spellings. Studies from peer reviewed journals or those presented in professional conferences were selected. Finally, studies with proper definition of sepsis and positive blood cultures were selected. **Result:** Twenty one studies from eleven resource limited settings were found. A total of 14,862 cases of sepsis were studied with 9260 (62.3%) of neonatal sepsis and 5602 (37.7%) of post neonatal sepsis. Challenges in the management of sepsis that were identified at the community level included: false cultural beliefs and practices, ignorance and poverty, poor health seeking behavior, late presentation, lack of access to skilled care and patronage of unskilled medical practitioners. While challenges identified at the hospital level include: poor knowledge skills of the health workers, delay in making a diagnosis and initiating treatment, poorly equipped laboratory materials and personnel, no protocol for management of sepsis, limited supply of bedside monitoring equipment, poor staffing, repeated industrial actions, use of fake drugs and high cost of care and drugs. **Conclusion and recommendation:** Management of sepsis in resource limited settings is an uphill task and requires health education and re-orientation of the people. To significantly reduce the mortality associated with sepsis, there is a need to bring health care services to the communities where the people are, improve the management skills of health professionals and translate major components of sepsis management to resource limited settings.

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## Keywords

Sepsis, Management Challenges, Resource-Limited Setting

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### 1. Introduction

Sepsis, a term hard to define, is said to be the systemic inflammatory response syndrome (SIRS) resulting from a suspected or proven infection [1]. The systemic inflammatory response syndrome (SIRS) is an inflammatory cascade that is initiated by the host in response to infection with bacteria, viruses, fungi, rickettsiae and protozoa [1]. Its clinical presentation has three stages depending on the severity, ranging from its early stage termed sepsis to a more severe stage termed severe sepsis and then to its most severe stage known as septic shock [1] [2].

Sepsis is usually caused by a pathogenic bacteria and the clinical diagnosis requires a high index of suspicion [3], as its clinical features in children are often non-specific and may progress rapidly to become a paediatric emergency requiring immediate attention [4] [5]. The definitive diagnosis of sepsis is mainly by isolation of causative bacteria or organism from a blood culture [6]. International guidelines recommend that appropriate blood cultures should be obtained before starting antibiotics and the latter should be started as soon as possible especially within the first hour of recognizing severe sepsis [7] [8]. The type of bacteria causing sepsis and its anti-bacterial sensitivity varies depending on the geographical location and the age group being studied [9]. In addition, particularly in neonates, one organism or a group of organisms may over time replace another as the leading cause of sepsis in a particular region [1] [10] [11].

Sepsis is a significant cause of morbidity and mortality especially in new born where it contributes up to 13% - 15% of deaths and 30% - 50% deaths in developed and developing countries respectively [12] [13]. In developed countries, population sepsis incidence ranged from 22 to 240/100,000, of severe sepsis from 13 to 300/100,000 and of septic shock 11/100,000 [14]-[19], with a case fatality rate up to 30% for sepsis, 50% for severe sepsis and 80% for septic shock, depending on the setting and severity of the disease [14]-[19]. In developing countries, national population incidences are unknown, but various hospital based studies among neonates from different countries show a prevalence ranging from 6 - 9/1000 live births in Ethiopia to 20.3 - 29.3/1000 live births in India [7] [20] [21]. It is also important to note that 20% - 30% of survivors of neonatal sepsis come down with neurological sequelae [22].

Despite this high morbidity and mortality rates, sepsis related mortality is however largely preventable with a high index of suspicion, early recognition, rational antimicrobial therapy and aggressive supportive care [23] [24]. The aim of this study is to highlight the challenges in the management of sepsis in resource poor environment and to make appropriate recommendations.

## 2. Methodology

Online Literature search using PubMed and Google database of citations and abstracts of biomedical articles of all cases of neonatal and post neonatal sepsis managed in different resource limited settings from 1990 to 2015 was done. Resource-limited settings or countries are low income or lower middle income countries whose gross national income (GNI) per capita is US\$1.025 or less in 2015 or between US\$1026 and US\$4035 respectively as classified by the World Bank [25].

Search terms used included: “sepsis”, “septicaemia”, “incidence”, “prevalence”, “morbidity”, “mortality” and “management challenges” using the English and American spellings to ensure a thorough search. The terms septicaemia and sepsis are used interchangeably in the academic literature [26], so both were used in the search and by shortening the word sepsis, studies that reviewed severe sepsis and septic shock were included. See flow chart below.

In the next stage of screening, only studies from peer reviewed journals or those presented in professional conferences that outlined the management challenges and had specific figures on prevalence, incidence, morbidity and mortality were selected. Finally, studies with proper definition of sepsis with positive cultures of blood were selected—See flow chart below. The obtained data were retrieved and categorized into individual and community level challenges and facility (hospital) level challenges and presented as prose and Table.

## 3. Flow Chart

**No of papers retrieved after searching PubMed and Google database (14,862)**

↓↓ Criteria 1-incidence/prevalence/morbidity/mortality/case fatality studies/management challenges: Titles only

**No of studies retained after applying criteria 1 (142)**

↓↓ Criteria 2-criteria 1 plus studies in children only/peer reviewed journal/professional conferences: abstracts only

**No of studies retained after applying criteria 2 (39)**

↓↓ Criteria 3-criteria 2 plus set definition of sepsis/positive blood cultures: full article

**No of studies retained after applying criteria 3 (21)**

↓↓

**No of studies included in results (21)**

## 4. Result

Twenty one studies from eleven resource limited settings were found. A total of 14,862 cases of sepsis were studied with 9260 (62.3%) of neonatal sepsis and 5602 (37.7%) of post neonatal sepsis (Table 1).

Challenges in the management of sepsis that were identified are grouped into two levels; individual and community level and facility (hospital) level.

The challenges at the individual and community level include: false cultural beliefs and practices, ignorance and poverty, poor health seeking behavior, late presentation, lack of access to skilled care and patronage of unskilled medical practitioners (**Table 2**).

While hospital level challenges include: poor knowledge skills of the health workers, delay in making a diagnosis and initiating treatment, poorly equipped laboratories materials and personnel, no protocol for management of sepsis, unpredictable supply of bedside monitoring equipment, poor staffing, repeated industrial actions use of fake drugs and high cost of care and drugs (**Table 2**).

**Table 1.** Distribution of sepsis and no of studies in the different study region.

Study Location	No of Studies	Neonatal Sepsis No (%)	Post Neonatal Sepsis No (%)	Total No (%)
West Africa	5	2504 (55.5)	2005 (44.5)	4509
East Africa	4	1307 (51.9)	1212 (48.1)	2519
North Africa	2	1236 (81.3)	285 (18.7)	1521
Southern Africa	2	1126 (74.5)	386 (25.5)	1512
Asian	3	1422 (56.8)	1081 (43.2)	2503
South American	2	656 (81.3)	151 (18.7)	807
Others**	3	1009 (67.7)	482 (32.3)	1491
Total	21	9260 (62.3)	5602 (37.7)	14,862 (100.0)

\*\* : Brazil, Norway, and Finland.

**Table 2.** Challenges identified in the management of sepsis by the studies.

Individual/ community challenge	No of studies reporting the challenge	Hospital challenge	No of studies reporting the challenge
False cultural beliefs and practices	17	Poor health worker skill	14
Ignorance and poverty	16	Delay in diagnosis and Treatment	8
Poor health seeking behavior	11	Poorly equipped laboratories	19
Late presentation	10	No management protocol	18
Lack of access to skilled care	17	Unpredictable supply of monitoring equipment	8
Patronage of quacks	16	Poor staffing	14
-	-	Repeated industrial actions	13
-	-	Use of fake drug	10
-	-	High cost of care and drugs	16

N/B: There was an overlap in the identified challenges in the different studies.

## 5. Discussion

Sepsis especially severe sepsis and septic shock is a complex medical condition that has multiple interactions with other diseases, because of which, it can be a difficult condition to identify even in the hands of specialist. There are other medical terms that are associated with sepsis, which complicates the diagnosis and identification of the condition further [26]. The treatment of sepsis also requires good knowledge base by the medical team and good monitoring equipments so it is associated with poor outcome when diagnosis and onset of treatment is delayed.

As common with several other medical conditions in resource-limited area especially patients who are rural dwellers, late presentation of patient with sepsis is rife due to often intertwined multifactorial reasons. The reasons range from false cultural beliefs and practices to ignorance and poverty and poor health seeking behaviour. Beliefs such as; the practice of inscription of multiple scarification marks and herbal medications on them as health remedies, smearing of cow dung on umbilical cord stump to enhance its early fall off and that sickness are punishment from the gods still pervade [27]. The basic explanation is that in serious illness there is an underpinning of the supernatural, the most frequently evoked agency is ancestral spirit anger [27]. Ancestral spirit constitutes part of the ordered structure of many rural dwellers. People believe that upsetting the ancestors produces a disturbance of this order and hence disharmony and illness occur [27]. These beliefs are further reinforced by poverty which prevails in the area and so it's no wonder that there is poor health seeking behaviour and late presentation. With late presentation, the stage for poor prognosis is already set.

When eventually these are overcome, access to skilled medical practitioners becomes the next hurdle, and because they are scarce and far-fetched within the communities, patronage of readily available quacks that have limited or no clue about sepsis is not surprising. Eventually, only the few who are able to surmount these obstacles and remain alive find themselves in a proper health facility. So facility level health indices that we have are merely a tip of an ice berg, because the bulk of the mortality takes place at the community level and is never reported [28].

At the facility level, poverty trails many of these patients. Many times the medical practitioner is confronted with a desperate mother or caregiver with a very sick child with little or no funds who is expecting to receive medical care. This is because these patients have expended the little they have patronizing quacks and so come in terminally ill or near so, looking very desperate and helpless expecting free health care from government funding which usually is a mirage. Out of pocket expenditures still dominate most of the medical expenses in resource poor settings as insurance schemes are limited and poorly funded.

For patients who present early to health facilities, recognition of signs of early sepsis is key to good outcome. However, even in the hands of the available limited specialist, this requires experience as there are no specific clinical features much less with the general medical officers which are usually the first point of

call. This delayed recognition means delayed referral which further delays the onset of care and worsens prognosis.

Laboratory support is essential in diagnosis and monitoring of patients with sepsis. Apart from the challenge of the costs of these laboratory tests, there is limited laboratory support, so many are unable to culture the offending bacteria, viruses and fungi with prolonged turnaround time.

Many Health institutions in resource limited setting depend solely on Government funding for the running and maintenance of the centres. However, with limited health budgetary allocation, it is becoming increasingly difficult to run these centres. The effects are multiple including epileptic power supply and frequent breakdown of many crucial equipments, inability to maintain staff welfare, poor staffing and recurrent industrial strikes. All of these adversely affect many patients and especially those with severe sepsis and septic shock who require close staff monitoring and monitoring equipments.

Despite recent advances in the understanding and treatment of sepsis, no data or recommendations exist that detail effective approaches to sepsis care in resource limited low-income and middle-income countries (LMICs) [7]. In many tertiary centres in resource limited settings, the internationally recommended “Surviving Sepsis Campaign” guideline [29] [30] for the management of sepsis has many drawbacks. This is because the evidence for the recommendations has been mainly gathered from studies in high-income countries and often this evidence cannot be directly translated to the resource-poor setting. Again, the guidelines rely on protocols and complex invasive technologies not widely available in most LMICs [7]. For example, therapeutic plan, informed by such guidelines, considers emergency care for the early stage of sepsis—0 to 6 hours (which some of our patients will not qualify for due to late presentation) and treatment for patients in later stages who require critical care [31]—many of these take place in Intensive Care Units (ICUs) which are limited in LMICs and expensive. Though improving in some countries, the few ICUs in resource limited settings have to function with important limitations in material and human resources [32] [33]. Laboratory support is limited, supplies of consumables and medication can be unpredictable, the cost of providing this care is enormous and often not affordable and proper maintenance of crucial equipment for monitoring and treatment is often a challenge [32] [33]. However, the “Surviving Sepsis Campaign” guidelines for severe sepsis and septic shock management have been implemented widely in ICUs in high-income countries and have, together with timely administration of essential therapies, contributed to improved survival [29].

Pivotal to a good outcome in children with sepsis is the timely initiation of appropriate antibiotics in the right dose, route and duration. In resource limited areas, where antibiotics are often available without prescription, its abuse and administration of suboptimal doses before hospital presentation is common. This causes low culture yield of the organisms, reduced antibiotic sensitivity and increases the incidence of antibiotic resistance [34] [35] [36]. Also, where the

right antibiotics are prescribed the high cost of the medications encourages the search for alternative unbranded and often fake drugs. All of these adversely affect the outcome of patients and worsens mortality.

The foregoing suggests that sepsis management in a resource limited setting is an uphill task and so we conclude that; false cultural beliefs and practices, Ignorance and poverty, poor health care funding and limited skilled health professionals at the communities and facilities are major challenges in the management of sepsis in resource poor setting.

We hereby recommend as follows: health education and re-orientation of the people especially women and the rural dwellers. Many people carry out certain practices because they are unaware of better way of doing things. A multi-disciplinary approach at national and international level of advocacy and re-conscientization should be employed to expose the dangers of these cultural (negative) practices and the need to adopt orthodox practices.

Improved distribution of skilled health care professional to rural communities. The National health system should endeavour to bring health care services to where the people are. This is because the majority of the people live in areas where general health care is inaccessible and the people give interpretations to the problems they cannot solve and make use of what they have. Incentives like higher remuneration to health professional in rural communities can be used to attract them to the rural communities.

Government should increase its funding of health institutions with improvement on staff remuneration. Regulation on over the counter purchase of medications and proliferation of fake drugs should be ensured by government and its agencies. Also, managers of health institutions should seek for public private partnership to improve funding and sustenance of Public Health Institutions.

Research and quality improvement initiatives at different levels targeted towards critical care in resource-limited settings are warranted.

Key concepts and components of sepsis management should be made translatable to resource-limited settings with collaborations made between countries with well-established ICUs and those with ICUs in their formative age.

Health care professional should acquaint and update themselves on knowledge and skills in the management of sepsis. This will enhance early and rapid recognition of sepsis and goal directed treatment thereby averting or reducing the high mortality associated with severe sepsis and septic shock.

Limitations of this study include:

The literature review for this study was limited to studies identified in PubMed and Google database, but could have been extended to other databases, like UN and WHO data bases, Global Health Search and the French search engine LILACS, Web of science, non-journal based data. Inclusion of non-English language articles may have increased the completeness of the review. Several non-English papers were excluded and others were not considered due to a lack of an English abstract.

Lack of funding was also a limitation as some of the excluded search engines

required finances to access their abstracts and articles.

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