A prospective study on clinical pharmacist intervention in assessing the management and treatment outcome of sepsis

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ABSTRACT

Sepsis is defined as a life threatening organ dysfunction caused by a dysregulated host response to an infection. When people suffer from sepsis, it results in widespread inflammation, swelling and blood clotting. This study targeted to assess the management and treatment outcome of sepsis. The study aims to identify the treatment patterns followed in various departments of hospital, to provide counseling to patients/bystanders, to give awareness to nursing professionals for early identification of sepsis. The study is a prospective observational study conducted for a period of one year. Patients and their caregivers were educated for special care on sepsis. An awareness session was provided to nursing professionals on early identification and care on sepsis. A total of 115 patients were recruited for the study that was screened for sepsis by Systemic Inflammatory Response Syndrome criteria. The result of the study indicated that there is a higher prevalence of sepsis patients with pulmonary disorders. Majority (63%) of the patients were provided with cephalosporins to treat the infection. 85% of the patients had a past history of diseases. Counseling was provided during ward rounds to patients and bystanders. 95% of the patients have recovered from the disease condition. The primary treatment provided, the details of the patients who were subjected to culture studies, treatment provided during discharge, patient counseling and educational programs to nurses were done during the study.

INTRODUCTION

Sepsis is defined as a life threatening organ dysfunction caused by a deregulated host response to an infection [1]. The infections of the lung, urinary tract or abdominal organs results in sepsis finally leading to inflammation, swelling and blood clotting. A significant decrease in blood pressure that reduces blood supply to vital organs can be witnessed in sepsis. Multiple organ failure and death are a result of lack of prompt identification and treatment of sepsis. Septic patients are more observed with readmissions, mortality and length of hospital stay when compared to patients treated for other conditions. The cost of treating sepsis is remarkably high and it exceeds the cost of treating congestive heart failure and acute myocardial infarction.

The outcome of sepsis can be elevated by early identification and prompt management. A number of actions ("bundles") in the current professional proposals can be followed the moment after diagnosis of sepsis. If there is an evidence of either low blood pressure or inadequate blood supply to organs, septic patients should receive antibiotics and intravenous fluids within the first three hours. Blood cultures should be obtained within this time period. Close monitoring of blood pressure and blood supply to organs should be in place after six hours, and the lactate should be measured again if initially it was raised.[2]The hospital admissions are common due to the increased prevalence of sepsis. People are living longer and more medical and surgical interventions are performed which lead to such a trend in the current scenario. It is witnessed that some cases of sepsis are preventable, particularly in groups of people who are at greater risk. The vulnerablity to sepsis are more among the very young, the very old and pregnant women. The lumber of sepsis in our healthcare system is significant with large digit of cases per year in India. The global efforts to recognize pathophysiology, improve early diagnosis, and standardize the management of sepsis resulted from the escalating incidence of sepsis and the unacceptably elevated mortality rates. It is important to understand the spectrum of disease for gauging severity, determining prognosis, and developing methods of standardization of care of sepsis. As the body does not differentiate the initial inflammatory phases of sterile inflammation from that of bacterial inflammation,

identifying sepsis can be a tackle. Medical providers more rapidly discover sepsis through proper education about its causes and symptoms to the patients and families. In the intensive care unit, patients and their families can support in preventing the progress of infections as early and effectively as possible. Time is of essence once sepsis is identified. The location and causes of the suspected infection should be established by the healthcare providers by ordering laboratory tests. The progress of the patient should be tracked and antibiotic therapy should be attuned accordingly.

The incidence of sepsis in hospitals can be lessened by proper patient counseling to the patients or the bystanders. Several points should be focused while counseling the patients. Awareness to the public and professionals concerning the prevention of infection can be achieved by good hand hygiene and hand washing techniques. Information regarding vaccinations like influenza (flu) in high risk patients will shrink the likelihood of septic condition. Community acquired sepsis and urinary tract infections are more likely observed in older patients. The incidence of sepsis can be dropped off by appropriate counseling to them. [3]

A clinical pharmacist can pick up the knowledge of hospital staffs regarding the identification and treatment of sepsis. Clinical pharmacist should confirm that sepsis is identified promptly and appropriately. Recording vital signs (pulse, blood pressure, heart rate, and respiratory rate) enables the recognition of sepsis. Educating the healthcare workers especially the nurses regarding the identification of sepsis symptoms and prompt recording of the vital signs can alert the physicians to start the treatment of sepsis immediately.

MATERIALS AND METHODS

A Prospective observational study was conducted for a period of one year with an aim of assessing the management and treatment outcome of sepsis from General medicine, Nephrology, Pulmonology and ICU departments of a tertiary care referral hospital, KIMS AL SHIFA Super Specialty hospital, Perinthalmanna, Malappuram, Kerala. The patients were

preferred from the departments by inclusion and exclusion criteria. This study was approved by the ethical committee of the institution and an official consent was also obtained for the purpose of performing the study. Adult patients presented with sepsis at the time of admission and sepsis developed inside the hospital during the hospital stay, patients more than 18yrs of age, patients agreeable to involve in the study were recruited. Pediatric patients, patients with psychological disorders, patients who were readmitted to ICU during their hospital stay were excluded from the study. An individually designed data collection form was used to record and collect patient data. All relevant data for the study were collected from case file, prescription, interviewing patient for medical history, relevant laboratory reports, medication chart, vital parameters, and medical diagnosis etc. The symptoms and laboratory parameters were also assessed. The site of infection was identified and antibiotics prescribed were also recorded. Patients and their caregivers were educated for unique care on sepsis and to prevent further occurrence of sepsis. An awareness session was conducted to nursing professionals on early identification and care on sepsis. Information concerning the care of sepsis was educated to them during the session. Data was entered into Microsoft excel and the recorded data were statistically analysed using statistical package for social sciences (SPSS) software version 23.0 for WINDOWS. Different tools were utilized to perform statistical analysis of data. Continuous data were summed up using mean and standard deviation (SD), categorical variables were summarized using frequency with percentage and analyzed using Paired t-Test. Repeated measure ANOVA was used to match up to the routine biomarkers of each patient.

RESULTS

The study regarding the management and treatment outcome of sepsis was conducted in a Super Specialty Hospital in Kerala according to a well-designed study protocol. Data were collected using an appropriate data collection form from various departments like General medicine, Pulmonology, Nephrology and ICU for a period of 12months. Maximum data were collected during the study period to assess the disease. A total of 115
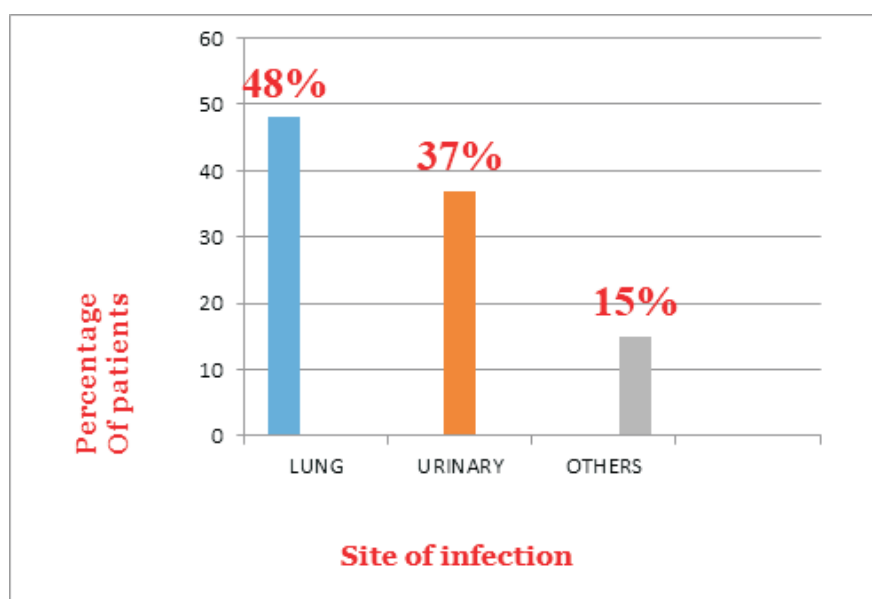

Fig 1 : Site Of Infection

patients were selected for the study who were screened for sepsis by SIRS criteria. These patients presented with an infection in a particular site in their body. Among the 115 patients included in the study, majority of the patients [48% (n=55)] exhibited pulmonary infections followed by patients with urinary infections, [37% (n=43)] (Fig.1). The remaining 15% (n=17) of the patients had sepsis in the abdomen, arthritic areas etc. Majority of the patients admitted in the hospital were already acquired with the sepsis from the community [67% (n=77)] (Fig.2). The remaining 33% (n=38) acquired sepsis after the admission to the hospital (hospital acquired). Culture studies in urine, blood, sputum or synovial fluid reflected that only 37% (n=43) of the patients were exposed to specific cultures related to their disease and in the remaining 63% (n=72), no culture studies were performed (Fig.3). It might be due to lack of time for the doctors to stay for the culture results to initiate the treatment. Experienced doctors may locate any kind of infection in the patient. This might assist them to start the treatment as soon as

possible. Gram negative bacteria accounted for majority of diseases (65%), followed by Gram positive bacteria (23%) [Fig.4. Fungal infections accounted for about 12% and there were no viral infections in any patients. Among the total antibiotics used, Cephalosporins accounted for about 63%. It was followed by a 10% use of carbapenems and 9% use of fluroquinolones. Other antibiotics like pencillins were used for 10% of the patients. Another 10% of the patients were not prescribed with antibiotics (Fig.5 About 51% (n=59) of the patients were provided with intravenous fluids throughout their stay in the hospital. The remaining 49% (n=56) were not under fluid treatment. Fluids like normal saline or lactated Ringer's solution are provided to survive the disease depending on the condition of the patient. Among the 115 patients treated for sepsis only 1% (n=1) was screened for sepsis condition with the q.SOFA scoring system (Fig.6). In the remaining 99% (n=114), q.SOFA was not performed. The q-SOFA or the Quick Sequential Organ Failure Assessment is the latest criteria or the scoring system to confirm the presence of
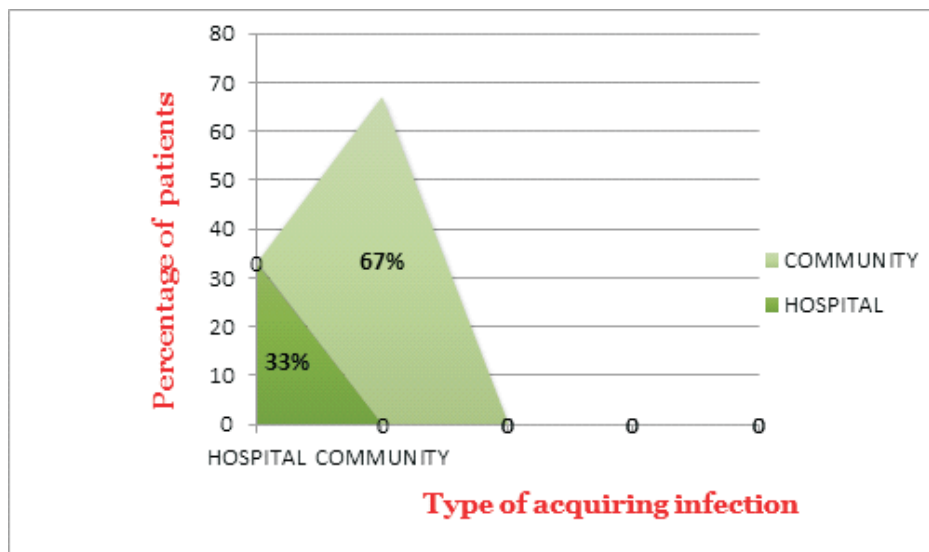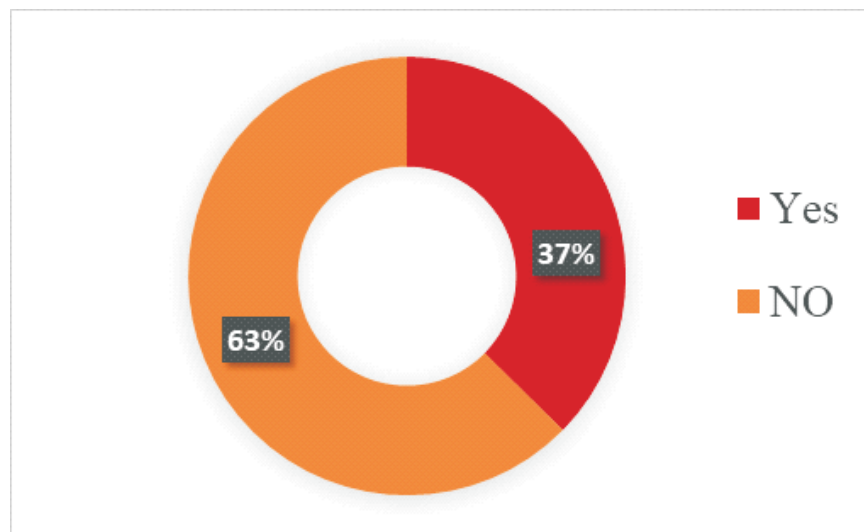

Fig 2 : Type Of Acquisition

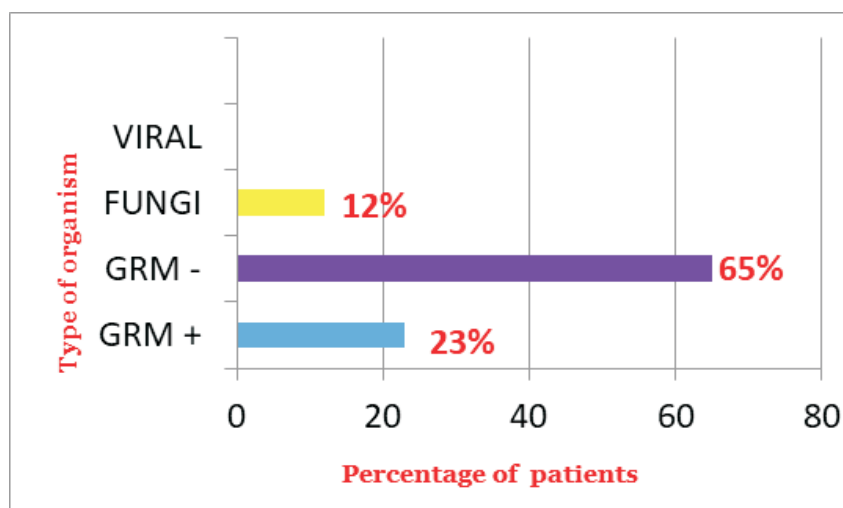
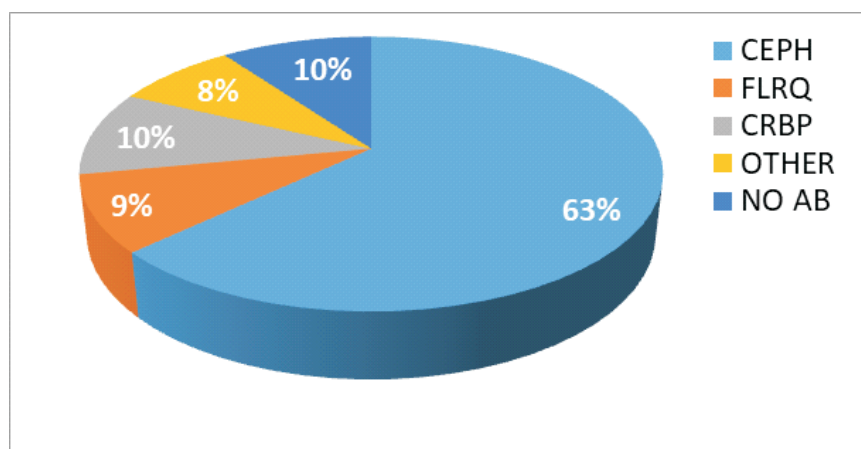**Fig 3 :** Culture Study

Fig 4 : Type Of Organism
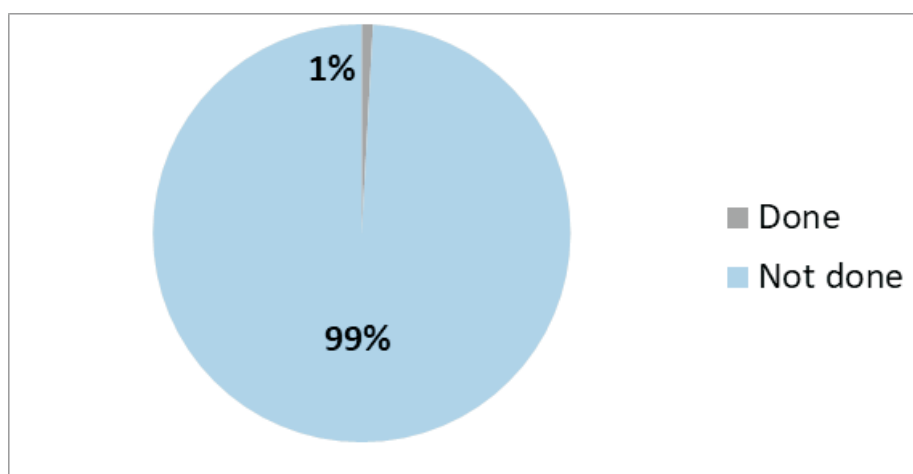

Fig 5 : Antibiotics Prescribed

Fig 6 : qSOFA performed

sepsis in a patient which is based on 6 organ systems (cardiovascular, respiratory, renal, liver, neurological and hematological). This score can predict mortality risk of septic patients. The laboratory tests done on patients at the time of admission and later during their hospital stay was observed. The parameters were analysed using paired t-test in order to verify their significance in the study. In the 90 patients who were tested for ESR values, it was observed that there is a significant

difference in the ESR with p-value < 0.05. This illustrates that the intervention is successful. 68 patients out of 115 were tested for polymorphs value. The p-value (<0.05) obtained in the table, denotes that there is a significant difference in the values observed. This reveals that the intervention was successful. Lymphocytes were tested for 62 patients and it was observed that there is a significant difference in the p-value (<0.05) obtained which highlights successful intervention. In the 80 patients tested for hemoglobin, the p-value obtained (<0.05) denotes there is a significant difference in the tested values. This shows that the intervention was successful. The vital signs like heart rate, respiratory rate, temperature and blood pressure were monitored 3 times a day and an average value was noted down continuously for four days during the hospital stay. The changes in the patient value were analysed using Repeated Measure Anova. The p-value (>0.05) obtained after statistical analysis showed that there no significant difference in the above parameter. Therefore, heart rate value is not significant. The respiratory rate illustrated a p-value <0.05 which showed there is a significant difference in the values obtained. The temperature showed a significant difference with a p-value <0.05. This focused on the statement that temperature is significant. Systolic Blood Pressure and Diastolic Blood Pressure were monitored. After analysis, the systolic BP showed a p-value <0.05 which explains about its significant difference. There is no significant difference in the diastolic BP and the p-value obtained here was >0.05.

DISCUSSION

Sepsis is a life threatening organ dysfunction caused by dys-regulated host response to an infection. It is a common cause of admissions in hospitals in a developing country like India. Out of 115 patients, all the patients were screened for sepsis confirmation using SIRS criteria. The WBC count in the SIRS criteria was excluded from the investigation as there was no routine observation in the septic patients. The blood pressure was included instead of the WBC count and their values were noted in the first 4days of hospital admission. The prevalence of patients with sepsis at the time of admission and during the admission in the hospital was studied. The patient demographic factors along with the condition and the treatment provided were studied in detail. Elderly patients (> 60years) are more prone to sepsis in the study. It might be due to their weakened immunity and their co-morbid conditions. This is similar to the study conducted by Mathew Inada-km et al [17] regarding the measurement of suspicion of sepsis. Another study conducted by T.T.S.Pary et al [23] established the mean age group presented with sepsis as +/- 54 yrs. The predominant site of infection in patients were the pulmonary area with disorders like pneumonia, bronchitis etc .This was the same as the study conducted by Sharmila Chattergee et al [8] in a tertiary care hospital in Kolkatta. The study carried out by T.T.S.Pary et al [23] also concluded that the respiratory tract infections are more in patients with sepsis conditions. Improper usage of inhalational devices containing steroids might be the reason for sepsis in pulmonary patients. Urinary tract infections are the next prominent infection seen in the hospital. Lack of proper catheter usage can be the reason for sepsis in such patients. Community acquired sepsis was more when compared to hospital acquired sepsis. The study conducted by Malvin Torsvik et al [6] also concluded a higher incidence of sepsis from the community. Lack of awareness of proper hygienic practices can be the source for higher rate of community acquired sepsis. The same was fulfilled by long term mortality study conducted by Henry.E.Wang *et al.*[7]The importance of culture studies were successfully revealed in the study conducted by Begum Sharifun Naher *et al* [8] in neonatal patients. Another study by Nguyen Duc Toan *et al*[9] also highlighted the importance of culture studies in sepsis patients. The importance of trends in vital parameters and routine biomarker studies was explained in the study handled by Vincent.M. Quentei *et al* [10].Study conducted by Ashham Mansur *et al* [11] concluded that a higher percentage of gram negative organisms were responsible for pulmonary infections in the human body. In the study performed by Malvin Torsvik *et al*[6] gram negative infections were predominant when compared to gram positive infections. Study conducted in neonatal patients in a tertiary care hospital by Begum Sharifun Naher[8], reported that gram negative organisms were more prevalent compared to other causative organisms. Jacky Ka Hing Chan and Yuen Ling Erica Leung [12] in their study observed that amoxicillin and clavulanate combinations were used to treat respiratory, urinary tract and intra abdominal infections. In their study, intra abdominal infections were paired with nitroimidazoles. The study performed by Malvin Torsvik *et al* [6] concluded that appropriate antibiotics are provided to the patients within 24hours of presentation of sepsis. The study conducted by Jason Phua *et al* [13] observed that broad spectrum antibiotics were broadly used to treat sepsis during their identification along with the fluids. Study conducted by Jason Phua *et a l*[13] in Asian Intensive care units explained about fluids provided to patients with or without vasopressors. An alternative study performed by T.T.S.Pary *et al* [6] in an Intensive Care unit in India justified about initial fluid administration based upon central venous pressure measurement, lactate clearance and urine output. SOFA scoring systems were employed in research study conducted by Jacky Ka Hing Chan and Yuen Ling Erica Leung[12]. They alerted the critical care physicians to promptly assess septic patients when quick SOFA score is 2 points or more. Deepanker Dutta *et al*[14] also included SOFA scoring system for early prediction of severe sepsis study. Ashham Mansur *et al*[11] investigated the mortality risk of respiratory and pulmonary and intra abdominal infections by quantifying SOFA scores and evaluated the requirement for organ support in the intensive care unit. The study was limited to few departments in the hospital excluding the gynecology and neurosurgery departments and the sepsis stages in patients were not identified. A post interventional study was not performed in patients to assess their improvement in their disease conditions. The importance of early identification of sepsis and monitoring the trends in vital signs and routine biomarkers were not discussed with the doctors treating sepsis conditions. The study can be continued in hospitals for proper identification and management of sepsis. Awareness to healthcare professionals regarding their role in sepsis management can be done as continuing educational programs. A proper guideline for early identification and management of sepsis can be introduced in the hospital.

CONCLUSION

The body's systemic inflammatory response to microbial infection which can cause organ damage, shock, and eventual death is referred to as sepsis. It can arise as a consequence of a variety of infections, though the most common sources are the lung, the urinary tract and the abdominal organs. It is most common in the elderly but also identified in patients of all ages. Even though more than 70% of cases are noticed from the community, a large proportion of the public do not recognize the symptoms, which can lead to a delay in the treatment. The range of health care professionals who come into contact with patients with suspected sepsis is huge. There is significant variation in the

training provided to different professional groups as many are unaware about the signs and symptoms of sepsis. This study mainly aimed at understanding the management of sepsis in various departments of a tertiary care hospital. The primary treatment provided, the details of the patients who were subjected to culture studies, treatment provided during discharge etc were studied. Majority of sepsis patients or their caregivers are unaware of the hygienic practices that should be followed in order to prevent the recurrence of the disease. Patient counseling provided during the ward rounds increased their knowledge about the sepsis care. Early identification of sepsis patients, their proper management and informing the physicians regarding the patient symptoms are the role of nursing professionals in order to start the treatment of sepsis as early as possible. As a healthcare professional, clinical pharmacist also have responsibility to provide awareness about this to the nursing professionals. The awareness session provided to the nurses inside the hospital in various departments helped to assess their knowledge regarding sepsis management.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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