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IMPACT OF FINANCIAL CONSTRAINTS ON SURVIVAL OUTCOMES IN PATIENTS WITH INFECTIVE ENDOCARDITIS

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Abstract

Objectives: To find out how resource constraint cost influences the survival of patients diagnosed with IE in a hospital setting in Pakistan.

Materials and Methods: The target population of this retrospective cohort study was 120 patients who had received an IE diagnosis at Peshawar Institute of Cardiology, Pakistan from January 2022 to December 2023. Making of some data includes demographic characteristics, concurrent diseases, microbiological results, delays in treating period due to financial problems, and survival status. For identification of the relationship between restrictions by financial resources and survival, the multivariate regression test models were used.

Results: Overall, 120 parties admitted to facing financial difficulties in availing diagnostic and treatment services with 42 percent of them being patients. Patients with impaired financial status had more in-hospital (25% vs 10%, $p < 0.05$) and overall (35% vs 15%, $p < 0.05$) mortality rates. Multivariate analysis revealed that financial constraints were independently associated with poorer survival outcomes (HR: 1.9, $p < 0.05$).

Conclusion: Limited financial resources remain an essential determinant of the outcome of infective endocarditis inflammatory processes, demonstrating the necessity of increasing access to medical care in low-income countries.

Keywords: Infective endocarditis, financial constraints, survival outcomes, healthcare access, Pakistan.

INTRODUCTION

Infective endocarditis (IE) remains a formidable and intensive medical problem despite recent developments in the area of diagnostic and therapeutic procedures in modern medicine. It is defined by inflammation of the endocardium which is not an effect of bacterial infection most of the times. Despite the fact that patients' prognosis has improved because of development of medical engineering as well as treatment regimens, the patients' survival has been generally low throughout the world and particularly low in the third world countries due to acute financial constraints. The impact of scarce resources on the outcome of infective endocarditis poses another interesting question in such a scenario is the basic need diagnosis, right antibiotics, and operation might not be readily accessible (1).

The studies carried out on clinical factors of the infective endocarditis prognosis revealed that clinical factors of the infective endocarditis seem to be related with the social economic status of the patient. This is because first diagnosis in the early stages, complex imaging and good quality health care available in developed countries earlier lead to better prognosis. Studies show that financial expectations may lower hospital admission, deny necessary and effective approaches to diagnosis and treatment, and postpone proper and appropriate treatment with further deterioration and inferior survival rates (2). Similarly, a study from the European Infective Endocarditis registry assessed by prospective cohort study, highlighted how the socioeconomic factors affected the treatment and outcome of infective endocarditis (3). In the same nation, for example, the lack of money slows the beginning of antibiotic use and surgical interventions that significantly reduce mortality rates (4).

Infective endocarditis is still a difficult disease because of different severity, signs, and symptoms as well as factors influencing the prognosis of the illness. The status of financial constraint is often compounded by other diseases and conditions related to patients with infective endocarditis. For example, patients with implants or prosthetic valves have a higher risk of developing endocarditis, and the treatment of such cases may not be easy and may be expensive, thus encourages inequalities in facilities in low income-setting (5). Moreover, neurological signs which are characteristic of the disease complicate the management and places extra pressure on the already overwhelmed health facilities (6). Such interactions present the rationale for examining how the resource deficiencies affect survival in a high-risk community.

Another challenge that poses during the management of infective endocarditis especially in low center setting is the issue of the ability to do cardiac surgeries. Through ESC-EORP EURO-ENDO registry it was identified that patients with left sided infective endocarditis and heart failure have adverse prognosis if they under-go cardiac surgery while they are ineligible for financial assistance (7). In most cases, the lack of cash to pay for such operations or their follow-up section contributes to the increase in heart failure, stroke, and lethality rates (8). In addition, the absence of qualified surgical teams, specialized surgical instruments, and well-equipped Intensive care units equally accounts for these poor prognoses of such patients (9).

The causative microorganisms in IE are also diverse based on geographical location, owing to differences in the standard of health care service delivery in the developing world. Low-resource settings experience increased cases of resistant bacteria, and this is because such infections require aggressive and longer periods of treatment. Hence, the ability to succeed in treatment is determined by financial resources (10). The link between microbiology and survival indicates that new strategies are necessary to reduce the adverse effects of financial hardships on the approach to and management of infective endocarditis (11).

This position is exacerbated by demographical factors within an age and chronic disease. Older patients are at a higher risk of diabetes, hypertension, and immunosuppression comorbidities, thus making them prone to worse effects of infective endocarditis (12). These patients lack adequate finances to get the best treatment and care, especially in the postoperative period, and they have higher mortality rates as a result of inadequate finances (13). However, the elderly are the worst affected by poor outcomes due to the fact that they cannot afford both healthcare and finance (14).

Thus, infective endocarditis remains a serious and complicated disease of the twenty-first century however, its prognosis relates to the financial aspect as opposed to countries such as Pakistan. This further lowers the mortality rate of patients with such conditions in that they do not receive crucial diagnostic, timely, efficient treatment and therapeutic measures. Consistent with the fact that financial aspects were influencing the clinical decision on infective endocarditis management, there is a need to devise corresponding healthcare policies and interventions that may possibly reduce mortality and improve clinical outcomes in low-resource settings (15).

Objective: The aim of the present study is to evaluate the role of financial aspects of patient outcomes as well as the ability of patient with infective endocarditis in Pakistan and the effect of the socioeconomic status on their success/failure rate.

MATERIALS AND METHODS

Study Design: This work employed retrospective cohort study design to assess the impact that financial constraints have on survival of patients with infective endocarditis.

Study setting: This research was carried out at the Peshawar Institute of Cardiology, Pakistan the hospital is a tertiary care facility with a special focus on the management of complicated cardiac disorders including infective endocarditis.

Duration of the study: This analysis was done for two years, starting from January 2022 to December of the year 2023, to obtain all the desired information about the patients.

Inclusion Criteria

The study involved patients 18 years and above, with first-time hospitalization, confirmed diagnosed with IE through clinical symptoms, microbiological culture, and echocardiography tests. This study analyzed patients admitted to the hospital during the study period only.

Exclusion Criteria

This excluded patients who could not provide complete clinical records at the time of analysis, those who did not meet the standardized definition of infective endocarditis per the modified Duke Criteria, or those who had a prior history of cardiac surgery.

Methods

Data were extracted from the medical records of patients diagnosed with infective endocarditis at Peshawar Institute of Cardiology, Pakistan from January 2022 to December 2023. Clinical features, including demographics, presence of co-morbidities, microbiological culture, sensitivity results, and presence of complications, were documented. Financial accessibility was evaluated according to patients' perceived barriers to seeking and receiving care, including delayed hospitalization, inability to pay for diagnostic tests, and limitations in obtaining surgeries or postoperative care. The effect of financial factors on survival was further investigated separately using multiple logistic regression models controlling for potential confounding factors, including age, gender, comorbid conditions, and severity of IE. The level of statistical significance was at $p < 0.05$. The required ethical clearance for the study was sought from the hospital's institutional review board.

RESULTS

Thus, 120 patients with infective endocarditis were consecutively enrolled in the study, whereas 95 (79.2%) patients met the inclusion criteria. Table 1 thus shows the demographic characteristics of the patients. The majority of the cohort (58%) were male, and the mean age was 47 years (range: 18-78 years). Overall, comorbidities were present, with 70% of patients having diabetes mellitus and 38% having hypertension.

Table 1: Demographic Characteristics of Patients

Characteristic	Value (%)
Male	58
Female	42
Age (Mean ± SD)	47 ± 12 years
Diabetes Mellitus	45
Hypertension	38
Intravenous Drug Use	15

Table 2 depicts the microbiological characteristics of infective endocarditis. Out of all the isolated pathogens the majority was identified as Staphylococcus aureus (34%), Streptococcus species (22%) and Enterococcus faecalis (18%). The rest 26% of cases were culture negative which is not uncommon in those populations where due to financial constraints they cannot afford elaborate diagnostic procedures.

Table 2: Microbiological Profile of Infective Endocarditis

Pathogen	Frequency (%)
Staphylococcus aureus	34
Streptococcus species	22
Enterococcus faecalis	18
Culture-negative	26

Lack of finances influenced the outcomes of patients' treatment. Among ninety-five patients, forty (42%) patients stated that their access to care was restricted due to a lack of sufficient funds. The above delays were mostly associated with the unaffordability to undergo diagnostic procedures, hospitalization and surgeries. Financial restraints and their correlation with the survival outcomes are described in table 3. Those who reported having limited resources had higher in-hospital mortality at 25%, as compared with 10% among patients who had no such constraints ($p < 0.05$).

Table 3: Survival Outcomes Based on Financial Constraints

Financial Constraints	In-Hospital Mortality (%)	Long-term Mortality (%)
Yes	25	35
No	10	15

Multivariate analysis showed that financial concern was independently predictive of poor survival. After adjusting for age, gender, and comorbid conditions, patients with financial limitations had a 1.9-fold increased risk of in-hospital mortality (95% CI: 1.1-3.4 and long-term mortality was 1.7 (95% CI: 1.2-2.5) times higher among patients receiving it. Furthermore, the study found an increase in heart failure and neurological deficits for patients who had delayed operations because of costs ($p < 0.05$). These studies highlighted how cost aspects impact the disparities in survival of patients who had IE, particularly in contexts where such benches are scarce in a country like Pakistan because of social-economic disparities.

Discussion:

In light of the findings of the present work, questions about the restricted funding emerge that are life-threatening in Pakistan for patients with IE. It has explained how large both in-hospital and short-term mortality risks associated with socioeconomic factors are and how even affordability adds to the difficulties of patients diagnosed with such severe and deadly disease. The present studies align these findings on worse prognoses for infective endocarditis clients in the health centers where the availability of the health facilities is a mirage due to the costs as compared to other observational studies (1, 2).

As the earlier studies mentioned, the research is found patients with poor financial situations had a delay in diagnosis and treatment. Two of the primary diagnosis difficulties come from a scarcity of resources for diagnosis procedures or even least imaging studies such as echocardiograms or blood cultures, which take time to get a diagnosis in a resource poor setting (3). If infective endocarditis is not diagnosed during the initial stage, the disease progresses and other complications including heart failure, stroke, sepsis and other features that increase the mortality rate are realized (4). Similar delays in diagnosis were observed to be most lengthened in the patients of lower economic class who still had to take longer time to be admitted to a hospital or be referred to another level of health care.

In addition, the microbiological characteristics of infective endocarditis in the present study are in concordance with prior studies where Staphylococcus aureus was identified to be the most prevalent pathogen, with Streptococcus species coming second (5). This aligns with existing data from the European Infective Endocarditis registry, where the authors stated that while the epidemiology of IE is different over the different regions, it is usually modulated by socioeconomic parameters like intravenous drug use and healthcare facility access (6). This scenario becomes worse in low-income settings where patients are reluctant to pay the costs associated with other tests, such as culture-based testing and other diagnostic procedures that are critical in the diagnosis of IE and identification of the

responsible pathogen and antibiotic regimen that should be used (7). Thus, a high proportion of our cases did not yield a positive culture, which emphasizes the challenges of diagnosing infective endocarditis in resource-restricted contexts in which more extensive microbiological work-up is not feasible (8).

The study also found a negative relationship between limited resources and higher in-hospital and long-term mortality rates. This observation is in harmony with previous studies revealing the worse prognosis related to finance as a delaying factor to accessing required health care in infective endocarditis and other infection courses. Disparities in the time to reach timely and appropriate treatment, including antibiotics and surgical procedures, had a significant impact on patients who experienced financial issues. For instance, the frequent late initiation of antibiotics in patients who could not access hospitalization or diagnosis may have led to an increase in mortality among this group (10). In addition, a lack of timely surgery suffices as a major therapeutic mode for patients with severe valve disease or partnership or complications like heart failure or abscess formation, which also compromises their survival rate. It's evident that those patients with infective endocarditis who do not undergo surgery at an early stage are more likely to develop complications and have an increased mortality rate (11, 12).

The influence of comorbidities on the survival of patients with infective endocarditis is very vital for any outcomes to be realized. As for our cohort, patients with diabetes mellitus and hypertension were identified as having a high risk of developing adverse outcomes, presumably due to the presence of comorbidities. It has been found out from many prior studies that conditions like diabetes and cardiovascular disease impact the outcomes of infective endocarditis because they might actually jeopardize the patient's immune system and put him/her at greater risk for both septic embolism, heart failure, and neurological complications (13). These patients have other diseases, which may include poorly controlled diabetes, and they are more likely to get complications or need intensive management. In low-resource facilities, the absence of medications and adequate care intensifies the management of these comorbidities, hence leading to poor results (14).

Besides medical management, other factors, like healthcare facilities infrastructure, are social determinants of health that influence the patient. The results of the current study underpin the need to reduce financial constraints to access health to enhance survival for patients with infective endocarditis. Pakistani patients especially cannot afford health care, which is why integrating economic factors is important to enhance the patient's survival rates. From the viewpoint of the WHO, increased accessibility of health facilities for the lower income groups is among the few important ways to help decrease health differences and increase the health of global populations (15). Therefore, healthcare financing will enable all patients to seek diagnostic, therapeutic, and surgical solutions for infective endocarditis regardless of economic status.

The study also revealed the negative consequences of delayed surgeries orchestrated by lack of funds. In severe left-sided IE with heart failure or valve dysfunction, early surgery reduces mortality and complications by a significant margin (16). Most of these delays result from a lack of adequate funds for the surgery and other related factors such as ICU admission, prolonged hospital stay, and expensive medications. The results are in accordance with a recent study that indicated that a conservative approach to cardiac surgery in IE patients was related to poor prognosis, especially in patients with neurological deficits or severe heart failure (17). While people from these regions have poor survival chances, surgery is necessary to enhance their survival, and risks indicate that financial constraints to surgery predispose such patients to death.

Finally, the conclusions of this study highlight the fact that financial factors are a major determinant of survival in patients with infective endocarditis in Pakistan. A combination of late diagnosis, inability to undergo operative procedures on time, and poor management because of monetary limitations leads to increased in-hospital and post-discharge mortality. Alleviating these financial constraints through investment in both a functioning healthcare system and in diagnostic and treatment services and by affording vulnerable patients can significantly enhance the progress and outcome of patients diagnosed with infective endocarditis. In future research, more should be done to

identify ways of financing health care and the policies for eradicating the influence of socioeconomic factors on patients' health.

Conclusion

The present work discussed the experience of Pakistan in ensuring the survival of patients with infective endocarditis with a focus on the role of limited financial resources. Late diagnosis missed access to appropriate diagnostics, and lack of funds to undergo procedures due to low socio-economic status lead to a trend toward worse outcomes measured by in-hospital and long-term mortality. Overall, our study points to the challenge of financial access to adequate, timely treatment and essential healthcare services where healthcare services in low-income settings are unaffordable. The study also puts a special focus on how comorbid conditions such as diabetes and hypertension contribute to the outcome of infective endocarditis. To enhance survival rates, the underprivileged financially should get more access to medical facilities, the financially burdened should get financial aid, and other anti-healthcare inequity policies should be designed. Managing these financial and social predeterminants will be crucial to enhancing the prognosis of Pakistan and comparable patients with infective endocarditis.

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