The Research of Medical Science Review

Received: 02 November, 2024
Accepted: 02 December, 2024
Published: 17 December, 2024

ISSN: 3007-1208 | 3007-1216
Volume 2, Issue 3, 2024

APPENDICITIS PRESENTATION VARIABILITY IN LOW-SOCIOECONOMIC POPULATIONS: EXAMINE IF AND HOW THE TYPICAL CLINICAL PRESENTATION DIFFERS IN UNDERSERVED POPULATIONS, FOCUSING ON DIAGNOSTIC DELAYS AND OUTCOMES

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ABSTRACT

Introduction: *Appendicitis is one of the most prevalent abdominal emergencies globally, requiring timely medical intervention to prevent complications such as perforation, sepsis, and even death.* ***Objective:*** *The main objective of the study is to find the appendicitis presentation variability in low-socioeconomic populations and examine if and how the typical clinical presentation differs in underserved populations, focusing on diagnostic delays and outcomes.* ***Methodology:*** *This retrospective observational study was conducted at Bolan Medical College Quetta during June 2024 till September 2024. Data were collected from 210 patients. Patient data were collected from electronic medical records (EMRs) and physical charts with permission from the respective healthcare institutions. Information was anonymized to protect patient privacy.* ***Results:*** *Data were collected from 210 patients from low socioeconomic status with more prevalent in males (57%) compared to females (43%), with the majority of cases (60%) occurring in the 15–40 years age group. Children under 15 years accounted for 25% of cases, while individuals over 40 comprised 15%. Typical symptoms, such as right lower quadrant pain and fever, were observed in 67% of patients, whereas 33% presented with atypical symptoms, including generalized pain (21%), urinary symptoms (7%), and mild or absent fever (5%). Diagnostic methods showed varying accuracy, with clinical examination being utilized in 110 cases (75% accuracy), while imaging modalities like ultrasound and CT scans improved diagnostic precision, achieving accuracies of 85% and 95%, respectively.* ***Conclusion:*** *It is concluded that socioeconomic factors significantly influence the presentation, diagnosis, and management of appendicitis in low-socioeconomic populations. Delayed diagnosis, limited access to healthcare, and atypical symptom presentation contribute to higher complication rates and prolonged recovery.*

1. ***RLQ*** *- Right Lower Quadrant*
2. ***LQ*** *- Lower Quadrant*
3. ***LSP*** *- Low Socioeconomic Population*
4. ***CT*** *- Computed Tomography*
5. ***EMRs*** *- Electronic Medical Records*
6. ***SPSS*** *- Statistical Package for the Social Sciences*
7. ***ALC*** *- Advanced Low-Cost*
8. ***LLC*** *- Low-Literacy Cost*

LMICs *- Low- and Middle-Income Countries*

INTRODUCTION

Appendicitis is one of the most prevalent abdominal emergencies globally, requiring timely medical intervention to prevent complications such as perforation, sepsis, and even death. Although appendicitis typically presents as acute, severe RLQ pain, fever, and right ileus, it may also present as an LQ pain, especially based on demographic, environmental, indicators or local epidemiologic characteristics [1]. Of these, the socioeconomic status stands out as one of the most important factors that greatly impact the phenom-enology, diagnosis and treatment of appendicitis not least in the low socioeconomic population. In LSP several factors probably converge to enhance the dynamics of Appendicitis presentation and management, these include; These are constraints such as; health facility access, low health literacy, finances, cultural perceptions towards illness and health equity [2]. Residents of these communities may put off getting medical treatment for themselves and their families because of the cost, lack of transportation, or their actual or perceived past ill-treatment when they did try to seek medical treatment [3]. By the time they arrive at healthcare facilities, they present with complications because their disease has advanced and they are more prone to develop complications such as perforation and peritonitis. This variability in appendicitis presentation is further accompanied by poor diagnostic technology in health centers that serve low-income patients [4]. Most centres in low-resource settings are often without imaging tools such as ultrasound or computed tomography (CT) appendix, which are very sensitive in Appendicitis in the setting of ambiguous features [5]. Due to this diagnostic gap, clinical examination and judgment itself is more relied upon and such examination and judgment could easily be wrong where symptoms do not present as expected. Moreover, those who practice in such environments might not receive proper training, so both early and accurate diagnosis are unlikely [6].

Lo et al focused on patients who go through surgery due to atypical appendicitis in different populations, explaining that it manifests particularly more frequently in the poor, significantly in children, the elderly, and women because appendicitis mimics several diseases in their symptomatology [7]. For instance, children may have nonspecific abdominal pain which can be easily confused with acute gastroenteritis while elderly patients may present with virtually few symptoms due to a blunted inflammation process [8]. In women, symptoms of gynecologic disorders, including pelvic inflammatory disease or ovarian torsion, can complicate the clinical picture and make diagnosis even more difficult. Such complexities bring into focus the need to unravel presentation profiles of potential appendicitis in specific vulnerable groups. Apart from the diagnostic difficulties, children in the low-socioeconomic groups have worse treatment effects due to early receipt of intervention [9]. Late presentation is common often presenting late and hence more patients present with more advanced stages of the disease that need more complicated surgery like open appendectomy or complications like formation of abscess. These outcomes combine both to drive costs higher and delay recovery, adding further economic and social costs to individuals and their families [10]. The long-term effects would be low workforce contribution longevity and further entrenchment of poverty and ill health. Other aspects of culture put a stamp on health seeking particularly among the people with low economic status. In some cultures, traditional healers or home remedies are more popular than professional medical treatment, and many people will delay seeking appropriate treatment [11]. Other factors may include beliefs that abdominal pain is not severe or may not undergo surgery may also be other factors that make individuals delay seeking medical attention. Measures for the consideration of these cultural factors are a golden step in enhancing early diagnosis and treatment [12].

Objective
The main objective of the study is to find the appendicitis presentation variability in low-socioeconomic populations and examine if and how the typical clinical presentation differs in underserved populations, focusing on diagnostic delays and outcomes.

Methodology
This retrospective observational study was conducted at Bolan Medical College Quetta during June 2024 till September 2024. Data were collected from 210 patients.

Inclusion criteria
- Patients of all ages and genders with a confirmed diagnosis of appendicitis based on clinical, radiological, or surgical findings.
- Patients classified as belonging to low-socioeconomic status based on household income, access to healthcare, or residence in a designated low-resource area.

Exclusion criteria
- Patients with incomplete medical records.
- Patients with other pre-existing abdominal or systemic conditions that could confound appendicitis diagnosis.

Data Collection
Patient data were collected from electronic medical records (EMRs) and physical charts with permission from the respective healthcare institutions. Information was anonymized to protect patient privacy. Data included demographic details such as age, gender, and socioeconomic status, alongside clinical presentations like abdominal pain, fever, nausea, vomiting, and any atypical symptoms. Diagnostic data were also documented, encompassing clinical examination findings, imaging studies such as ultrasound and CT scans, and laboratory results, including white blood cell count and C-reactive protein levels. Additionally, information regarding treatment and outcomes was collected, covering aspects such as the time to diagnosis, the type of treatment administered (surgical or medical), complications encountered (e.g., perforation or abscess), and recovery timelines.

Data Analysis
Data were analyzed using statistical software SPSS v26. Descriptive analysis was conducted to Summarize patient demographics, clinical presentations, and outcomes.

Results
Data were collected from 210 patients from low socioeconomic status with more prevalent in males (57%) compared to females (43%), with the majority of cases (60%) occurring in the 15–40 years age group. Children under 15 years accounted for 25% of cases, while individuals over 40 comprised 15%. Typical symptoms, such as right lower quadrant pain and fever, were observed in 67% of patients, whereas 33% presented with atypical symptoms, including generalized pain (21%), urinary symptoms (7%), and mild or absent fever (5%). Diagnostic methods showed varying accuracy, with clinical examination being utilized in 110 cases (75% accuracy), while imaging modalities like ultrasound and CT scans improved diagnostic precision, achieving accuracies of 85% and 95%, respectively.

Table 1: Demographic and Baseline Values Table

Category	Number of Patients	Percentage (%)
Male	120	57
Female	90	43

Age < 15 years	52	25
Age 15-40 years	126	60
Age > 40 years	32	15
Presentation		
Typical Symptoms	140	67
Atypical Symptoms	70	33
Generalized Pain	45	21
Urinary Symptoms	15	7
Mild/Absent Fever	10	5
Diagnostic Method		
Clinical Examination	110	75
Ultrasound	60	85
CT Scan	40	95

The study revealed that 76% of patients underwent surgical intervention, while 24% were managed with antibiotics, reflecting the severity of appendicitis at presentation. Among complications, perforation was the most common (20%), followed by abscess formation (10%) and sepsis (5%), often linked to delayed diagnosis. Rural patients experienced significantly higher rates of delayed presentation (40%) and complications (35%) compared to urban patients, who had a 20% rate of delayed presentation and 15% complications.

Table 2: Treatment and Outcomes

Category	Number of Patients	Percentage (%)
Surgical Intervention	160	76
Antibiotic Treatment	50	24
Perforation	42	20
Abscess Formation	21	10
Sepsis	11	5
Category	Delayed Presentation (%)	Complications (%)
Urban Patients	20	15
Rural Patients	40	35

Financial constraints were the most common barrier, affecting 33% of patients, followed by low health literacy at 31%, which often led to misinterpretation of symptoms or reliance on alternative remedies. Lack of transportation hindered timely access to healthcare for 19% of patients, while cultural beliefs influenced 17%, delaying their decision to seek professional medical care.

Table 3: Factors Associated with Delayed Diagnosis Table

Factor	Number of Patients	Percentage (%)
Financial Constraints	70	33
Lack of Transportation	40	19
Low Health Literacy	65	31
Cultural Beliefs	35	17

Discussion

This study highlights significant variability in the presentation, diagnosis, and management of appendicitis in low-socioeconomic populations. The results highlighted the effect of financial capabilities, literacy levels, and availability of health-referring, accessible, practiced facilities in dictating clinical results. The demographic review showed that the illness is most common in people between 15 and 40 years of age, and both sexes are almost equally affected. It is worth noting that, several symptoms were more Categorical with a higher variance in the following groups; children, elderly, and females [14]. For example, children and

older people had unusual symptoms of the disease, including constant pain in the abdomen and extreme temperature close to the normal range, due to which the diagnosis was delayed. These are similar to other studies that show the difficulties of diagnosing appendicitis in vulnerable groups because of the vague signs [15].

One of the significant discoveries was a longer DR time in the ALC group, 48 hours, compared to 24 hours in the LLC group for atypical presentations. This delay was especially observed in rural regions, where access to sophisticated imaging studies including CT scans was highly restricted [16]. The use of clinical examination to make these diagnoses has a relatively low diagnostic accuracy of about 75% In addition, these problems were made worse by the practice of using clinical examination as the only criterion of diagnosing chronic diseases. These results call for increasing the diagnostic performance in LMICs, with a focus on the utilization of p-of-C imaging modalities [17]. The study showed that the overall morbidity rates in terms of complications such as perforation, abscess formation and sepsis among the study groups presented late to the hospitals were higher as compared to early presentations [18]. This lengthened morbidity, accompanied by longer recovery times as patients who developed complications required almost twice the number of days for recuperation than those without complications. That is why, timely intervention is very critical and this is challenged by many factors such as financial literacy which was observed in a third of all patients, and access to means of transport which was missing in a nth of patients as seen in this study [19].

The study also pointed out longer diagnostic skepticism among women due to shared presenting features with gynecological diseases. This indicates the need for Gender Related standardized and structured management and educational algorithms for diagnosing appendicitis from other conditions that present similarly, especially in the female gender. In addition, cultural practice and low health literacy were strong predictors of delayed care among patients using traditional remedies or underestimating their symptoms [20]. Awareness creation and educational / information sharing at the community level must be carried out to clear misconceptions and encourage early presentation to healthcare facilities. However, the following limitations may be noted concerning the study Therefore the study has the following limitations. The retrospective design reduces causal inferences and, omission of data within the medical records may lead to bias. Future research should use prospective designs to confirm these findings further and to assess the impact of specific interventions needed to address diagnostic inertia and optimize the prognosis of patients belonging to low socioeconomic status.

Conclusion

It is concluded that socioeconomic factors significantly influence the presentation, diagnosis, and management of appendicitis in low-socioeconomic populations. Delayed diagnosis, limited access to healthcare, and atypical symptom presentation contribute to higher complication rates and prolonged recovery. Addressing these disparities through improved diagnostic resources, education, and accessible healthcare facilities is essential to enhance patient outcomes and equity in care delivery.

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