Pakistan Journal of
Medical & Dental Sciences

ISSN Print: 3078-4263
ISSN Online: 3078-4271

Volume 1 Issue 2, July-December, 2024

PJMDS

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Editorial Correspondence: editor@pjmds.online & editorial_office@pjmds.online
Website: www.pjmds.online
Publisher: SCORM Services (Rgd)
Designed and Layout by: Yasir Shaikh
Graphic Designer, SCORM Services

Pakistan Journal of
Medical & Dental Sciences

PJMDS

Volume 1 - Issue 2, July-December, 2024

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MS No: PJMDS/OA/020/2024

Original Article

Platelet Count/Spleen Diameter Ratio: A Non-Invasive Predictor of Esophageal Varices in Patients with Cirrhosis

Aleem Riaz Qureshi[1], Sundus Aleem[2], Akram Bajwa[3], Riaz Hussain[4], Nandlal Seerani[5], Mohsin Ali[6], Syed Imtiaz Ali[7]

ABSTRACT

Objective: To determine the diagnostic value of platelets count/spleen ratio for detection of esophageal varices in cirrhosis patients.

Methodology: The research was conducted from February 2023 to March 2024 at Liaquat University of Medical & Health Sciences (LUMHS). The sample of 153 cirrhotic individuals of both genders aged 18 to 75 years were incorporated into the research by using non-probability, purposive sampling. Platelet counts, and spleen diameters were measured to calculate the PC/SD ratio. Patients underwent endoscopy to verify the existence of EV. Analysis of data was conducted using SPSS 26.0. The receiver operating characteristic (ROC) curve was performed to evaluate the prediction performance of the PC/SD ratio, with the area under the curve (AUC) computed for sensitivity and specificity.

Results: The mean ± standard deviation of age of the 153 participants was noted as 53.63±9.02 years. Among them 103 (67.3%) were male and 50 (32.7%) were female. Patients with EV showed significantly reduced PC/SD ratio ($p < 0.001$). A cutoff of ≥412.50 demonstrated a sensitivity of 95.1% and a specificity of 79.2%, leading to an AUC of 0.737, indicating moderate accuracy. At this cutoff, the positive likelihood ratio was 4.57. Lower cutoff values increased sensitivity but reduced specificity.

Conclusion: The platelet count-to-spleen diameter (PC/SD) ratio is an easily obtainable, non-invasive predictor of esophageal varices (EV) in liver cirrhosis. These results imply that the PC/SD ratio could be utilized in the routine screening to avoid invasive endoscopy and add an economic value in terms of reducing the cost of healthcare. Additional extensive research with a larger sample size across different study centres in Pakistan is necessary to validate the findings of the current study.

Keywords: Cirrhosis, Esophageal varices, ROC curve, Platelet count, Spleen

INTRODUCTION

Cirrhosis is a progressive liver disease frequently complicated by gastroesophageal varices (GEV) characterized by dilated veins within the esophagus and stomach. GEV develops in approximately 7–8% of cirrhotic patients annually, the transition from tiny to big varices occurs at an annual rate of 10–12%[1]. Variceal bleeding is a severe consequence affecting about 5% of patients per year and is linked with a six-week death rate of 15–25% [2,3].

To address this risk, several non-invasive methods have emerged for predicting GEV. These encompass liver stiffness measurement (LSM), spleen stiffness measurement, and the platelet count to spleen diameter ratio (PSDR)[4]. A systematic meta-analysis reported that endoscopy is the definitive standard for the identification of gastro-esophageal varices (GEV), it is an invasive, costly procedure requiring specialized expertise, making it unsuitable as a routine screening tool in all settings[5]. The Baveno VI consensus recommendations advise against endoscopy in individuals with liver stiffness below 20 kPa and platelet levels over 150 × 10^9/L, as their risk for varices requiring treatment is below 5%[6].

Different studies have investigated non-invasive metrics for GEV prediction, but none have achieved universal acceptance.

Corresponding Author
Aleem Riaz Qureshi
Email: draleemqureshi92@gmail.com

Affiliations:
Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro
Postgraduate Trainee at [1,2,3,5,6,7]
Associate Professor[4]

Submitted: September 03, 2024
Revised: November 21, 2024
Accepted: November 22, 2024

Research by Yu et al. also supports PSDR's role as a potential predictor with the area under the curve (AUC) values of 0.907 [7]. Despite promising findings, the accuracy and utility of PSDR remain under-examined due to limited evidence, and no standardized non-invasive tool currently exists for GEV assessment.

Jamil Z, et al and Xu XD, et al stated the effectiveness of PSDR for predicting esophageal varices across different cirrhosis types indicating strong reliability[8,9]. The study by Rahmani et al. extended its application to pediatric patients, emphasizing its versatility[10]. Studies from Mahfuzzaman M, et al and Khadka D, et al found PSDR as a cost-effective tool in resource-limited settings[11,12]. Berger et al. highlighted its practical use where advanced diagnostics are inaccessible[13].

Kothari et al. found PSDR useful in identifying variceal bleeding risk in alcoholic cirrhosis[14] while Mossie et al. confirmed its high sensitivity and specificity[15]. Ozdil et al. linked lower PSDR values to larger varices[16]. Bhattarai et al. provided evidence for its role in risk stratification[17].

Esophageal varices (EV) are a severe complication of cirrhosis, associated with significant morbidity and mortality. While endoscopy remains the gold standard for EV detection, its invasive nature and high cost limit its routine use. Non-invasive markers like the platelet count-to-spleen diameter (PC/SD) ratio show promise as reliable alternatives. Despite encouraging results in earlier studies, there remains a lack of population-specific validation and cost-effectiveness analysis in resource-constrained settings. This study aims to evaluate the diagnostic accuracy of the PC/SD ratio in predicting EV among cirrhotic patients, addressing these critical gaps.

METHODOLOGY

The research was carried out in the Department of Gastroenterology at Liaquat University of Medical & Health

Sciences (LUMHS), Jamshoro, from February 2023 to March 2024. The sample of 153 patients was selected through non-probability, purposive sampling. The sample size was determined based on the area under the curve (0.907)[7], margin of error (d)=5%, and confidence interval (C.I) = 95% by using the statistical formula for sample size calculation i.e., $N = \frac{Z^2 \times V(AUC)}{d^2}$. The inclusion criteria included adult patients aged 18 to 70 years of either gender, with liver cirrhosis (characterized by diffuse hepatic fibrosis, nodular transformation of liver architecture, and ultrasonographic findings such as coarse liver echotexture, increased echogenicity, and irregular margins, with or without portal hypertension), a cirrhosis duration of at least six months, and symptoms of hematemesis (vomiting blood) or melena (black tarry stool). Patients with hemophilia, liver malignancies, prior liver surgery or local treatments, splenomegaly, or severe complications like hepatic encephalopathy or hepatorenal syndrome, as well as those taking immunosuppressive or platelet-affecting medications were excluded from the study. Informed written consent about the study was obtained from all the included patients. The same protocols were followed through all steps of data collection to ensure consistency throughout the study. Blood samples (5 cc) were collected by trained phlebotomists, suspected laboratory platelet counts were measured by the laboratory according to standard operating procedures for hematology that are regularly done in order to avoid variability. Spleen diameter was measured by certified radiologists by abdominal ultrasonography using calibrated equipment and standardized protocols. The PC/SD ratio was calculated by dividing the platelet count by the spleen diameter in millimeter, and the method was uniformly reported. Patients then underwent upper gastrointestinal endoscopy to verify the existence of EV which were identified based on established procedural guidelines, defined as visibly dilated submucosal veins in the lower one-third of the esophageal wall projecting into the lumen. The analysis of data will be conducted using SPSS version 26.0. Descriptive statistics were used to report the demographic and baseline data of the patients. The receiver operating characteristic (ROC) curve was generated, and the area under the curve (AUC) was calculated, along with optimal cut-off settings for the sensitivity and specificity of the PC/SD ratio.

RESULTS

Table I represent the baseline and clinical characteristics between study participants with and without esophageal varices (EV). The mean age of the participants was noted as 53.11 ± 9.03 years for the EV group and 54.21 ± 9.03 years for the non-EV group, with no significant difference (p = 0.455). Gender distribution also showed insignificant difference (p = 0.123) with male proportion in EV group (72.8%) and non-EV group (61.1%). The Child-Pugh classification shows similar proportions across classes A, B and C between both groups (p = 0.594), but numerically there were more C class patients in the non-EV group (8.6% vs. 11.1%). Lifestyle factors, including smoking (32.1% in EV vs. 30.6% in non-EV, p = 0.837) and alcohol use (11.1% in EV vs. 16.7% in non-EV, p = 0.319), show no significant differences. The incidence of Type 2 Diabetes Mellitus is 13.6% in the EV group and 9.7% in the non-EV group (p = 0.460), which is also non-significant. Laboratory values such as WBC count (3.71 ± 0.74 in EV vs. 3.63 ± 0.73 in non-EV, p = 0.496), RBC count (4.25 ± 0.38 in EV vs. 4.33 ± 0.36 in non-EV, p = 0.174), and hemoglobin levels (125.67 ± 12.69 in EV vs. 124.94 ± 11.99 in non-EV, p = 0.719) show no significant group differences. Liver function indicators, including ALT (38.67 ± 23.53 in EV vs. 37.82 ± 21.17 in non-EV, p = 0.816), AST (47.74 ± 20.60 in EV vs. 46.29 ± 19.03 in non-EV, p = 0.653), AKP (95.43 ± 21.37 in EV vs. 91.94 ± 16.45 in non-EV, p = 0.264), and GGT (41.57 ± 13.59 in EV vs. 47.74 ± 19.51 in non-EV, p = 0.024), are statistically comparable between groups, as are bilirubin (28.91 ± 6.66 in EV vs. 29.35 ± 6.27 in non-EV, p = 0.680), albumin (39.73 ± 3.52 in EV vs. 40.17 ± 3.83 in non-EV, p = 0.462), and creatinine (67.30 ± 7.68 in EV vs. 68.14 ± 7.32 in non-EV, p = 0.490). Blood glucose levels (5.89 ± 0.41 in EV vs. 5.81 ± 0.47 in non-EV, p = 0.324) and mean arterial pressure (91.16 ± 3.99 in EV vs. 91.28 ± 4.11 in non-EV, p = 0.859) are also similar across groups. However, spleen diameter is found to be non-significant difference between groups with a notably high mean in EV group (13.84 ± 1.62 mm) as compared to non-EV group (13.72 ± 1.46 mm) and p value (0.610). The platelet count-to-spleen diameter (PC/SD) ratio was markedly reduced in the non-EV group as compared to the EV group (624.49 ± 208.78 vs 807.23 ± 205.88; P <0.001), indicating that this ratio might be a key predictive marker of EV.

The Platelet Count/Spleen Diameter ratio is used to predict esophageal varices in patients with liver cirrhosis, as indicated by the Receiver Operating Characteristic curve as shown in **Figure 1**. A visual evaluation of the predictive accuracy of the PC/SD ratio is provided by the ROC curve, which plots sensitivity against 1-specificity. The predictive value of the test is increased as the curve approaches the top-left corner. The current study the AUC for the PC/SD ratio was noted as 0.737 and demonstrates moderate accuracy for predicting esophageal varices in this study. An AUC value of 0.737 indicated good discriminative ability of the PC/SD ratio.

Table II shows the data on predictive indices on PC/SD ratio for detecting EV in liver cirrhosis individuals. The area under the curve (AUC) was 0.737±0.040 [95% confidence interval, 0.658 to 0.816]. This value of AUC shows a moderate diagnostic accuracy which indicates that the PC/SD ratio is a fair predictor between patients with and without esophageal varices. Using a cut-off value of ≥412.50, the PC/SD ratio achieved a high sensitivity of 95.1%, indicating that it is highly effective at identifying patients with esophageal varices. A moderate specificity of 79.2% shows that it has limited power to actually rule out the lack of varices. The positive likelihood ratio of 4.57 indicates that individuals with a PC/SD ratio above the cut-off are approximately 4.6 times more likely to have esophageal varices than those who do not achieve the cut-off ratio. The low probability of esophageal varices estimated to be present in the patients having a PC/SD ratio below the cut-off, indicated by the negative likelihood ratio (0.062), indicates that this tool can be used as a helpful non-invasive and reliable screening.

Table III shows sensitivity and specificity values for different cutoff values of the PC/SD ratio, allowing a more detailed approach on assessing diagnosis accuracy based on PC/SD. As shown in Table II, the optimal cutoff at this value is ≥412.50 (sensitivity 95.1%, specificity 79.2%), which relates to the values from Table III at this cutoff (sensitivity 0.951, specificity 0.792). As indicated in table III, this cutoff achieves the most optimal combination of high sensitivity and moderate specificity which fits well for a diagnostic scenario as it is critical to avoid false negatives (high sensitivity). For lower cutoff values, such as 349.00, both sensitivity and specificity are perfect (1.000), but as the cutoff increases, specificity generally decreases while sensitivity remains high, until reaching 412.50, where the balance is optimal. After this point sensitivity begins to drop off significantly with higher cutoffs, indicating that the ability to identify true positive cases declines.

Table I: Baseline Characteristics of Study Participants (n=153)				
Variables		**Esophageal Varices**		**P-Value**
		Yes, (n=81)	**No**, (n=72)	
Age in years, Mean ± SD		53.11 ± 9.03	54.21 ± 9.03	0.455
Gender	Male, n (%)	59 (72.8)	44 (61.1)	0.123
	Female, n (%)	22 (27.2)	28 (38.9)	
Child Pugh Class	A, n (%)	58 (71.6)	46 (63.9)	0.594
	B, n (%)	16 (19.8)	18 (25.0)	
	C, n (%)	7 (8.6)	8 (11.1)	
Smoking History, n (%)		26 (32.1)	22 (30.6)	0.837
Alcohol Use, n (%)		9 (11.1)	12 (16.7)	0.319
Type 2 Diabetes Mellitus, n (%)		11 (13.6)	7 (9.7)	0.460
WBC in 10^3/L, Mean ± SD		3.71 ± 0.74	3.63 ± 0.73	0.496
RBC in 10^{12}/L, Mean ± SD		4.25 ± 0.38	4.33 ± 0.36	0.174
Hemoglobin in g/l, Mean ± SD		125.67 ± 12.69	124.94 ± 11.99	0.719
INR, Mean ± SD		1.03 ± 0.18	1.01 ± 0.14	0.424
Prothrombin time in second, Mean ± SD		12.16 ± 1.10	12.27 ± 1.15	0.564
ALT in IU/l, Mean ± SD		38.67 ± 23.53	37.82 ± 21.17	0.816
AST in IU/l, Mean ± SD		47.74 ± 20.60	46.29 ± 19.03	0.653
AKP in IU/l, Mean ± SD		95.43 ± 21.37	91.94 ± 16.45	0.264
GGT in IU/l, Mean ± SD		41.57 ± 13.59	47.74 ± 19.51	0.024
Total bilirubin in umol/l, Mean ± SD		28.91 ± 6.66	29.35 ± 6.27	0.680
Albumin in g/l, Mean ± SD		39.73 ± 3.52	40.17 ± 3.83	0.462
Creatinine in umol/l, Mean ± SD		67.30 ± 7.68	68.14 ± 7.32	0.490
Blood glucose in mmol/l, Mean ± SD		5.89 ± 0.41	5.81 ± 0.47	0.324
MAP in mmHg, Mean ± SD		91.16 ± 3.99	91.28 ± 4.11	0.859
Platelets in 10^9/L, Mean ± SD		81.62 ± 21.77	83.33 ± 23.25	0.638
Spleen Diameter (SD) in mm, Mean ± SD		13.84 ± 1.62	13.72 ± 1.46	0.610
PC/SD ratio, Mean ± SD		807.23 ± 205.88	624.49 ± 208.78	0.0001

WBC, white blood cell; RBC, red blood cell; INR, international normalized ratio; ALT, alanine aminotransferase; AST, aspartate aminotransferase; AKP, alkaline phosphatase; GGT, γ-glutamyl transpeptidase; MAP, mean arterial pressure; PC/SD, Platelet count/diameter of the spleen.

Figure-1

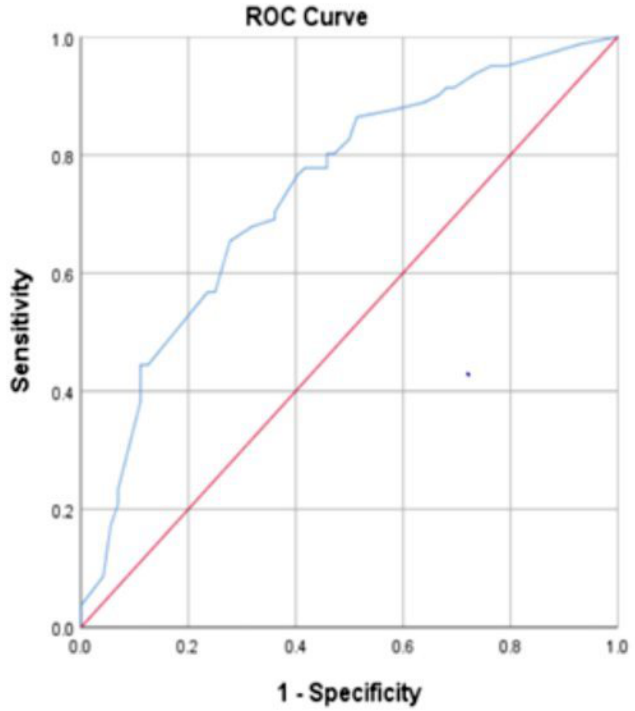

Table II: Predictive Value of PC/SD Ratio for Esophageal Varices in Liver Cirrhosis (n=153)

Area under the curve (AUC)	0.737
Std. Error	0.040
95% Confidence Interval	0.658----0.816
P-Value	0.0001
Cut off value	≥412.50
Sensitivity	95.1%
Specificity	79.2%
Positive Likelihood Ratio	4.57
Negative Likelihood Ratio	0.062

Table III: Coordinates of the Curve (n=153)

Cut Off Values	Sensitivity	Specificity
349.00	1.000	1.000
375.00	.988	.931
412.50	.951	.792
430.00	.951	.764
442.50	.938	.736
452.50	.914	.694
457.50	.914	.681
465.00	.901	.667
497.50	.889	.639
537.50	.877	.583
555.00	.864	.514
567.50	.827	.500
582.50	.802	.472
600.00	.802	.458
620.00	.778	.458
635.00	.778	.417
645.00	.765	.403
651.00	.704	.361
701.00	.691	.361
770.00	.679	.319
795.00	.654	.278
815.00	.568	.250
840.00	.568	.236
869.00	.444	.125
894.00	.444	.111
925.00	.383	.111
953.50	.235	.069
968.50	.210	.069
990.00	.173	.056
1015.00	.086	.042
1115.00	.037	.000
1201.00	.000	.000

DISCUSSION

This research assesses the predictive significance of the platelet count-to-spleen diameter (PC/SD) ratio as a non-invasive indicator for esophageal varices (EV) in individuals with hepatic cirrhosis, demonstrating its potential clinical utility. By establishing a cut-off value of ≥412.50, this study achieved a high sensitivity of 95.1% and specificity of 79.2%, indicating that the PC/SD ratio can effectively identify patients with EV while moderately ruling out those without it. This finding is consistent with earlier studies such as those by Yu et al.[7] and Basha et al.[3] The study of Basha et al.[3] stated the cut-off value of ≤1014, with a sensitivity of 92.77% and specificity of 64.71%, whereas Yu et al.[7] reported sensitivity of 86.4% and specificity of 77.1% with cut-off value of ≤909[7]. Both studies noted similar predictive accuracies for PC/SD ratio, suggesting it, as an efficient substitute to invasive endoscopic procedures for routine EV screening. The area under the curve (AUC) of 0.737 found in this study supports these findings, AUC values ranging from 0.7 to 0.8 indicate reasonable diagnostic accuracy[4]. Yu et al. found in the study an AUC of 0.884[7] while the study by González-Ojeda A, et al. reported an AUC of 0.802[23]. In clinical practice, where reducing unnecessary endoscopies is critical, a reliable non-invasive marker like the PC/SD ratio could alleviate patient burden and lower healthcare costs, aligning with the Baveno VI consensus recommendation to avoid endoscopies in low-risk cirrhotic patients with low liver stiffness and high platelet counts[6]. Jamil Z, et al noted AUC of 0.883 with a cutoff value of ≤1077.42, sensitivity of 88.75%, and specificity of 81.43%[8].

Different studies have noted the need for the PC/SD ratio emphasizing its diagnostic relevance. For example, Alam, et al reported comparable AUC values for the PC/SD ratio to predict EV underscoring its diagnostic need in diverse populations[5]. Cho, et al.[1] suggested that this combination with other non-invasive markers (like liver stiffness) could complement the information on diagnostic accuracy although simplicity in calculation and interpretability make the PC/SD ratio attractive for clinical practice. Still, Mattos et al. pointed out that the PC/SD ratio is likely to miss potential improvements in accuracy possibly provided by a multi-parametric approach[4]. The simplicity-precision trade-off supports a potential limitation of this study, wherein future research could explore additional biomarkers in parallel to ratio of PC/SD.

The strength of recent study is its relatively large sample size which enhances the reliability of findings. The present investigation was a single-center study, and this may restrict generalization to the populations. A collection of patient studies led by Kraja B and associates[18] illuminated wide-ranging efficacy of the platelet count to spleen diameter ratio across diverse demographic and clinical circumstances, highlighting the necessity for multi-center investigations to authenticate the test's predictive power globally. Moreover, this analysis neglected other confounding elements influencing esophageal varices evolution such as liver ailment origins and portal hypertension as pointed out in works from Faheem HA, et al., Patil S, et al. and corroborated in research by Elatty EA and colleagues as well as Kumar P and partners[19-22].

Evaluating these additional parameters may enhance the understanding of variceal risk and increase the relevance of the platelet count to spleen diameter ratio across diverse patient groups.

CONCLUSION

The platelet count-to-spleen diameter (PC/SD) ratio is an easily obtainable, non-invasive predictor of esophageal varices (EV) in liver cirrhosis. These results imply that the PC/SD ratio could be utilized in the routine screening to avoid invasive endoscopy and add an economic value in terms of reducing the cost of healthcare. Additional extensive research with a larger sample size across different study centres in Pakistan is necessary to validate the findings of the current study.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contributions: All authors took part in this study to an equal extent. **Aleem RQ:** Conceptual framework, conducted data collection and methodology. **Sundus A:** Literature review and bibliography. **Akram B:** Assisted with statistical analysis and methodology. **Riaz H:** Supervised and conceptualized the study and also helped in Data validation and writing - review & editing. **Nandlal S:** Facilitated patient consent and provided clinical input throughout the study. **Mohsin A:** Helped in Formatting and Discussion. **S Imtiaz A:** Provided oversight and essential critique to help ensure the integrity of the study

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How to cite: Aleem RQ, Sundus A, Akram B, Riaz H, Nandlal S, Mohsin A, Imtiaz A. Platelet Count/Spleen Diameter Ratio a Non-Invasive Predictor of Esophageal Varices in Patients With Cirrhosis. Pak J Med Dent Sci. 2024;1(2):34-39

MS No: PJMDS/OA/021/2024

Original Article

Frequency of Common Infertility Causes in Patients Attending Infertility Clinic at Civil Hospital Karachi

Saima Iqbal[1], Sikandar Ali[2], Sajjad Ali[3], Tanweer Ahmed[4], Shahzeena[5], Abdullah Shaikh[6]

ABSTRACT

Objective: To determine the frequency of causes of infertility in infertile couples attending the infertility clinic of Ruth K.M. Pfau Civil Hospital Karachi.

Methodology: This descriptive cross-sectional study was conducted at the Infertility Clinic of Ruth K.M. Pfau Civil Hospital, Karachi, from January 2024 to June 2024. A total of 323 infertile couples were included, with female partners aged 22–40 years, male partners aged 25–55 years, and a marital duration of > 1 year. The study focused on key infertility causes, including male factors, ovulatory disorders, fallopian tube disorders, and endometriosis. Data collection involved detailed clinical histories, while diagnostic evaluations included semen analysis and ultrasound assessments. Statistical analysis was performed using SPSS version 26.0.

Results: The study included 323 couples, with mean ages of 33.24±5.071 years for husbands and 27.25±4.355 years for wives. Most of the couples (83.3%) had been married for 1–6 years, with 57.6% experiencing primary infertility and 42.4% secondary infertility. Ovulatory disorders were the most common female factor (49.8% in women aged 22–30 years and 56.3% aged >30 years, O.R. 0.772, p=0.411). Fallopian tube disorders (14.2% vs. 29.2%) and endometriosis (16.4% vs. 6.3%) showed significant age-related differences (O.R. 0.401, p=0.010) & (O.R. 2.935, p=0.047). Male factor infertility affected 17.3% of men aged 25–35 years and 14.3% aged >35 years (O.R. 1.256, p=0.564).

Conclusion: The findings of this study indicated that primary infertility was the most prevalent type, and ovulatory disorders was the most common female factor, followed by fallopian tube disorders and endometriosis, both of which had a significant association with age. Male factor infertility was less common, and age did not contribute significantly. This highlights the need for thorough assessments of both partners to guide focused and effective infertility treatment.

Keywords: Endometriosis, Fallopian tube disorders, Infertility, Ovulatory disorders, Male factor

INTRODUCTION

Infertility is a worldwide public health problem defined as pregnancy without birth after 1 year of regular and unprotected intercourse. Around 10–15% of couples face it globally, with wide variation between regions[1]. The prevalence of infertility varies between 6.9% and 18.9% in developing countries depending on cultural, environmental, and socio-economic reasons[2]. Infertility is classified into primary and secondary; couples who have not been pregnant are said to have primary infertility, whereas secondary infertility is impaired conception after the first successful pregnancy[3].

Adverse effects of infertility go beyond medical issues to fundamental social and psychological matters. Infertility is thus a distressing and upsetting problem for people and couples affected by it as their ability to have children is often linked to social identity, marital stability and personal fulfillment in many societies[4].

Corresponding Author
Saima Iqbal
Email: saimaiqbal235@gmail.com

Affiliations:
Senior Registrar, OBS and Gynecology, Dr. Ruth K. M. Pfau Civil Hospital Karachi.[1]
Consultant Urologist, Memon Medical Institute Hospital.[2]
Consultant Urologist, Sindh Institute of Urology and Transplantation.[3]
Assistant Professor, Urology, Baqai University, Karachi.[4]
Senior Registrar, OBS and Gynecology, Dow International Dental and Medical Hospital.[5]
Senior Registrar, Urology, Indus Medical College, Tando Muhammad Khan.[6]

Submitted: September 12, 2024
Revised: December 05, 2024
Accepted: December 06, 2024

Infertility is multi-factorial and can be due to female, male or both factors. Around 50-55% of female infertility is related to ovulatory disorders, and 20-35% is related to tubal factors[5]. Other important etiologies are endometriosis, abnormalities of the uterus and polycystic ovary syndrome (PCOS)[6]. Male infertility, diagnosed in 20–40% of all infertile couples[6], may be due to poor sperm quality[7], hormonal[8], and lifestyle factors, including, but not limited to smoking or drug use[7].

When it comes to fertility, lifestyle factors are key. Reproductive health of both sexes is adversely influenced by deleterious factors including smoking, being overweight and/or obese, excessive use of alcohol and exposure to environmental toxicants e.g. pesticides, heavy metals[8]. The next important factor is the advanced maternal age; after 35 years, female fertility decreases significantly due to diminished ovarian reserve and oocyte quality[9]. Likewise, in men, aging leads to reduced sperm motility and sperm with higher genetic aberrations[10].

Around 10-15% of couples have an unexplained fertility factor despite extensive testing. This emphasizes the intricacy of reproductive biology and its requirement for sophisticated diagnostic methods[11]. Infertility is not just a health issue but a social problem, especially in cultures where bearing children is part of the structure of social roles[1]. The stigma of infertility, especially in developing countries, is more heavily placed on women[12]. Infertile women in some societies, however, incur harsh punishment such as social ostracization, marital discord, and/or physical violence[13]. This stigma comes down to couples as well, adding stresses to relationships and combining emotional and psychological impact[14].

Infertility incurs heavy psychological burdens, including anxiety, depression, self-blame, and social isolation. Women experience greater psychological distress according to other studies, owing partially to psychological pressure and

perception of infertility as a personal failure[15,16].

The diagnosis and treatment of infertility has been revolutionized by modern diagnostic tools and therapeutic interventions. The gold-standard techniques for the evaluation of uterine and tubal factors are diagnostic laparoscopy and hysteropasalpingography[16]. In both partners, hormonal evaluations, semen analysis and imaging modalities are used regularly to detect the underlying causes[17].

Options range from lifestyle changes and medications to assisted reproductive technology. Infertility diagnosis and treatment is one of the most synergic visions obtained from the fusion of basic and clinical research, with breakthroughs such as in-vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) bringing new hope to many couples (>70 million ART cycles expected to be performed around the world by 2040[18]. Yet, access is impeded by the high costs and scarcity of these technologies in resource-limited contexts[19].

There have been great advances but gaps in knowledge and care remain. Education background & cultural beliefs usually delay the timely treatment. Many couples seek traditional healing or non-medical solutions before they consult a healthcare practitioner which makes the condition even more complex[20].

The current study was designed to assess the frequency of causes of infertility in infertile couples presenting to infertility clinic. Identifying the most common etiologic causes, the present study aims to help direct focused diagnostic and therapeutic approaches. Moreover, this information will assist in developing more targeted public health interventions that can effectively improve awareness, reduce stigma and improve access to fertility care in low-resource settings.

METHODOLOGY

This descriptive cross-sectional study was conducted, at the infertility clinic of Ruth K.M. Pfau Civil Hospital, Karachi, Pakistan, over six months, from January 2024 to June 2024. A total of 323 married couples, diagnosed with infertility were included. The sample size was calculated through the W.H.O sample size calculator on the basis of primary infertility (70%)[21], margin of error (d)=5% and confidence level (C.I)=95%. The inclusion criteria required female partners to be aged 22 to 40 years, and male partners aged 25 to 55 years, with marital duration exceeding one year. The participants were required to have complete clinical and laboratory data to ensure comprehensive analysis.

Couples were excluded if they had a history of advanced infertility treatments (e.g., in-vitro fertilization [IVF] or intracytoplasmic sperm injection [ICSI]) to focus on primary diagnostic assessments. The participants with uncontrolled chronic medical conditions (e.g. poorly managed diabetes or thyroid disorders), known genetic, or congenital infertility disorders, or untreated reproductive infections (e.g., pelvic inflammatory disease or sexually transmitted infections) were excluded due to the confounding effects of these conditions on infertility outcomes. The recent pregnancy loss, or abortion within the last six months was also an exclusion criterion to eliminate transient infertility. Participants with a history of heavy substance abuse or smoking, which are well-established risk factors for infertility, were excluded to avoid skewing the analysis. Furthermore, the participants unable to provide informed consent due to psychological or cognitive impairments were also excluded to ensure ethical participation.

The study received approval from the institutional ethical review board and a written informed consent was obtained from all the participants before inclusion. Details regarding demographic and clinical histories were collected which included age, duration of marriage, and monthly income. The data on infertility types classified as primary (no prior conception) or secondary (difficulty conceiving after a prior pregnancy) were systematically documented.

The diagnoses of infertility causes were performed using the standardized protocols. The male factor infertility was analyzed through semen analysis evaluating sperm count, motility, morphology and other seminal parameters according to World Health Organization (WHO) criteria. Analyses were conducted in the certified laboratories to ensure precision and consistency. The ovulatory disorders were diagnosed, based on clinical history, menstrual cycle assessment, and hormonal profiling, including levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), and anti-Müllerian hormone (AMH). Ultrasound findings indicative of polycystic ovary syndrome (PCOS) was evaluated according to the Rotterdam criteria.

Fallopian tube disorders were primarily diagnosed using hysterosalpingography (HSG), a gold-standard imaging technique for assessing tubal patency and structural abnormalities. In cases where additional detail was required, transvaginal ultrasound or sonohysterography was employed to detect pelvic adhesions or other anomalies. The endometriosis was identified through the combination of clinical examination, and imaging modalities including transvaginal ultrasound for ovarian endometriomas, and pelvic adhesions, laparoscopy was used as a definitive diagnostic tool in the cases, where imaging findings were inconclusive.

Participants were counseled on their diagnostic findings and guided toward therapeutic options tailored to their specific diagnoses, including assisted reproductive technologies (ART), ovulation induction, or surgical interventions.

The data collected was analyzed using the SPSS version 26.0. Descriptive statistics, including mean± standard deviation with frequencies and percentages, were calculated to summarize demographic factors and causes of infertility. The Chi-square test was applied to assess the statistical association at 5% level of significance.

RESULTS

Table I reported a detailed overview of the demographic characteristics of the study participants, which include the age of both husbands and wives, the duration of marriage, monthly income levels, and the type of infertility experienced by the participants. Regarding the husbands' age, the mean was noted as 33.24 years with a standard deviation (SD) of ±5.071. The majority of husbands (80.5%) lie within the 25–35 years age group, while a smaller proportion (19.5%) were aged above 35 years. Similarly, the wives were predominantly younger, with a mean age of 27.25±4.355 years. Among them most of them (85.1%) were in the 22–30 years age group, and only 14.9% were aged above 30 years, indicating that the study population primarily consisted of younger couples. The duration of marriage was another significant demographic characteristic of the study. The mean duration of marriage was noted as 4.76±1.723 years. Among them 83.3% couples had been married for a relatively short period between 1 and 6 years, while a smaller proportion (16.7%) reported a marriage duration > 6 years. The monthly income was distributed into three groups highlighting the socio-economic status of the study participants. A significant majority (65.6%) noted their family income was > 50,000 rupees per month highlighting a higher income demographic for the most participants,

meanwhile, 29.7% of participants had an income ranging from 20,000 to 50,000 rupees, and small minority (4.6%) earned less than 20,000 rupees monthly reflecting a diverse economic distribution within the study sample.

Finally, the study also stated the type of infertility experienced by the participants. Primary infertility was the most commonly reported type affecting 57.6% of patients while remaining 42.4% reported experiencing secondary infertility. This distribution shows a slight predominance of primary infertility among the study population.

Table II compares infertility causes across various age groups, for both husbands & wives, stated the rate of male factor infertility, as well as ovulatory disorders, fallopian tube disorders, and endometriosis. Among husbands, male factor infertility was observed in 17.3% of men aged between 25–35 years and 14.3% of those aged over 35 years, with an odds ratio (O.R.) of 1.256 (95% confidence interval [C.I.]: 0.578–2.727) and a p-value of 0.564, indicating statistically insignificant difference between the age groups. Ovulatory disorders were noted as the most common cause of infertility, affecting 49.8% of women between age group 22–30 years and 56.3% > 30 years of age, with an O.R. of 0.772 (95% C.I.: 0.416–1.432) and a p-value of 0.411, showing insignificant association with age. Fallopian tube disorders were reported in 14.2% of women in the younger age group and 29.2% in the older age group, yielding an O.R. of 0.401 (95% C.I.: 0.198–0.815) and a p-value of 0.010, similarly showing age related significance. Endometriosis was noted in 16.4% of women aged 22–30 years and 6.3% > 30, indicating the statistically significant difference with (O.R: 2.935; 95% C.I.: 0.874–9.857 & p = 0.047).

Table I: Demographic Characteristics of Study Participants (n=323)

Variable	**n (%)**
Husband's Age (Mean ± SD) = 33.24 ± 5.071	
25-35 years	260 (80.5)
>35 years	63 (19.5)
Wife's Age (Mean ± SD) = 27.25 ± 4.355	
22-30 years	275 (85.1)
>30 years	48 (14.9)
Duration of Marriage (Mean ± SD) = 4.76 ± 1.723	
1-6 years	269 (83.3)
>6 years	54 (16.7)
Monthly Income	
< 20,000 rupees	15 (4.6)
20,000-50,000 rupees	96 (29.7)
>50,000 rupees	212 (65.6)
Types of Infertility	
Primary	186 (57.6)
Secondary	137 (42.4)

Table II: Comparison of Infertility Causes with Age Groups

Infertility Causes	**Husband's Age Group**			**P-Value**
	25—35	**>35**	**O.R 95% C. I**	
Male Factor, *n* (%)	45 (17.3)	9 (14.3)	1.256 (0.578----2.727)	0.564
	Wife's Age Group			
	22—30	**>30**	**O.R 95% C. I**	**P-Value**
Ovulatory Disorders, *n* (%)	137 (49.8)	27 (56.3)	0.772 (0.416----1.432)	0.411
Fallopian Tube Disorders, *n* (%)	39 (14.2)	14 (29.2)	0.401 (0.198----0.815)	0.010
Endometriosis, *n* (%)	45 (16.4)	3 (6.3)	2.935 (0.874----9.857)	0.047

DISCUSSION

In infertility clinics, the most common causes of infertility can be broadly categorized into male and female factors. Female factors often include ovulatory disorders, fallopian tube blockages, and endometriosis, with ovulatory dysfunction being a primary cause, particularly in women of advanced age. These factors contribute significantly to primary infertility, which is more commonly observed than secondary infertility. Male infertility, often attributed to sperm abnormalities such as low count or motility, accounts for a substantial proportion of cases as well. Lifestyle factors, hormonal imbalances, and structural abnormalities can exacerbate male infertility. Both partners contribute to infertility, and it is essential for clinicians to evaluate both male and female factors to ensure comprehensive diagnosis and management. Early diagnosis and targeted treatments, such as hormonal therapies, surgical interventions, or assisted reproductive technologies, can significantly improve outcomes. Addressing these common causes in infertility clinics will guide clinicians in offering personalized, effective fertility treatments.

In the current study, we found that 57.6% of the couples had primary infertility, whereas 42.4% of the couples had secondary infertility. A similar study by Masoumi et al. in Iran, also found that primary infertility (70%) was more frequent among couples than secondary infertility (30%)[21]. In the prospective cohort study by Zhu et al. in Shanghai, China, the overall incidence of primary infertility was 19% and secondary infertility was 4%[22]. Similarly, in an Indian study, the prevalence of primary infertility was greater than secondary infertility among married couples (58% vs 42%)[4]. However, studies conducted in Central Africa and Saudi Arabia reported the prevalences of secondary infertility higher than primary infertility, 13.2% and 80.2%, respectively[5,9]. This variation in the trend of type of infertility might be due to differences in measuring techniques of primary and secondary infertility rates.

In the current study, the female factor is a more frequent cause of infertility, whereas 16% of the patients had a male factor. In an Irani study conducted by Kazemijaliseh et al., ovulatory dysfunction (40%) and male factors (29%) were the commonest causes of infertility[22].

Additional analysis of our study showed that fallopian tube disorders and endometriosis were significantly associated with the age of females. Whereas ovulatory disorders were the common cause of primary infertility, which could be because of higher marital ages of females and propensities of delayed conception among couples[11]. A local study by Haider F, et al stated that primary infertility was prevalent in 55% of patients and 45% in secondary infertility[23]. The study also reported that 51% patients were diagnosed with ovulatory disorders, endometriosis was noted in 13%, fallopian tube disorder was recorded in 21% and male factor was noted in 15% of patients[23].

Older age is also considered a potential risk factor for infertility in female partners[12-15]. In our study we found male age was not related to male factor, most of the patients with male factor were aged 25 to 35 years. Masoumi et al. found that 43% of the infertile males were of age 30 to 40 years[21]. Furthermore, various research has shown a significant reduction in sperm motility with an increase in male age[4].

Our study had some limitations. It did not examine male infertility risk factors or analyze variations in infertility causes based on education or socioeconomic status. Additionally, this single-center study's limited sample size may restrict its generalizability. Future multi-center studies with larger samples are recommended to further explore these socio-demographic factors in infertility.

The strength of the study is in the comprehensive analysis of primary & secondary infertility highlighting gender specific causes & providing a contextual comparison with global and regional data. The findings recommend a holistic approach to infertility evaluation, ensuring both male & female factors are thoroughly evaluated, prior to initiating aggressive line of treatment. Special emphasis should be there on reproductive counseling, and the timely interventions for women with advancing age.

CONCLUSION

The findings of this study indicated that primary infertility was the most prevalent type, and ovulatory disorders was the most common female factor, followed by fallopian tube disorders and endometriosis, both of which had a significant association with age. Male factor infertility was less common, and age did not contribute significantly. This highlights the need for thorough assessments of both partners to guide focused and effective infertility treatment.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contributions: **Saima I:** Served as corresponding author coordinated the overall research process and collected the data. **Sikandar A:** Developed the literature review and conceptual framework, while **Sajjad A:** Was responsible for data collection, drafting the manuscript, and managing references. **Tanweer Ahmed:** Supervised the study carried out data analysis, developed the methodology, interpreted results, and drafted the discussion section. **Shahzeena:** Worked on the discussion and comparison of findings with existing literature. **Abdullah S:** Worked on final drafting and bibliography. Additionally, all authors contributed to reviewing, editing, and finalizing the manuscript for submission.

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How to cite: Saima I, Sikandar A, Sajjad A, Tanweer A, Shahzeena, Abdullah S. Frequency of Common Infertility Causes in Patients Attending Infertility Clinic at Civil Hospital Karachi. Pak J Med Dent Sci. 2024;1(2):40-44

MS No: PJMDS/OA/022/2024

Original Article

Frequency of Diseases Patterns in Internally Displace Children During Flood Disasters at Tertiary Care Hospital Larkana

Allah Bux Bhutto[1], Shanti Lal Bhojwani[2], Nazia[3], Suhail Abbasi[4], Paras[5], Sadam Bhutto[6], Rahmatullah Tunio[7], Farooq Indhar[8], Komal[9], Noor[10].

ABSTRACT

Objective: To determine the frequency of disease patterns in internally displaced children during flood disasters.

Methodology: Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU) Larkana from July 2022 to March 2023. A total of 507 IDP children, aged 6 months to 15 years, affected by recent floods, were included in the study after taken written informed consent from their parents. All the children were screened for malaria, dengue fever, chikungunya, typhoid fever, gastroenteritis, diarrhea, pneumonia and skin diseases. Data were analyzed using SPSS version 26. Mean ± SD was reported for continuous variables while frequency and percentage were reported for categorical variables.

Results: The mean age of the participants was noted as 4.085 ± 2.9637 years. Out of 507 children (51.7% male, 48.3% female). The prevalence of malaria was found to be higher in the 0.5–4 years group as compared to 4.1–15 years group (p=0.013). Similarly, the younger children had higher rates of gastroenteritis, diarrhea, and pneumonia (P ≤ 0.05). However, skin diseases were more common in the age group 4.1–15-year (p=0.0001). The rate of pneumonia was noted as significantly higher in males as compared to females (p=0.025).

Conclusion: The findings of the current study show that the younger internally displaced children were more susceptible to diarrhea, pneumonia, and gastroenteritis, while skin diseases were more common in older children. The risk of pneumonia was significantly high in younger children. Problems with housing, water, and socioeconomic status may have caused the observed patterns. These findings suggest targeting healthcare for younger children and improving living conditions for displaced populations.

Keywords: Children's health, Disease patterns, Flood disasters, Internally displaced persons, Waterborne diseases

INTRODUCTION

Pakistan, currently grappling with its yearly monsoon season that traditionally brings massive floods to most of the country, has been heavily impacted by climate-induced natural disasters. The particularly heavy monsoon rains every year — which are caused by a succession of low-pressure systems that move from the Bay of Bengal north-east across northern India — inundate rivers, inundate large areas and affect tens of millions of lives[1]. With Pakistan ranked amongst the most flood prone countries across the globe, annually on average more than 500,000 people are affected from floods[2].

Notably, the 2022 apocalyptic floods in which the country recorded 190% rainfall over the normal, led to a displacement of over 8 million people and affected 33 million in 116 districts[3]. The event destroyed infrastructure and severely challenged the healthcare system, which then had to deal with dealing with complex public health problems[4]. There is evidence that the floods led to increases in waterborne and vector-borne diseases, including malaria, dengue and gastrointestinal diseases, especially among displaced people living in crowded and poor conditions[5,6].

Various studies have reported that healthcare facilities in flood-affected areas were overwhelmed, leading to increased numbers of respiratory infections and diarrheal disease cases[7]. One theory for this rapid emergence of infectious diseases is the contamination of water bodies and the shortage of drinking water sources and sanitation[8]. History of predisposing conditions for environmental disease transmission after extremes of weather in Pakistan and neighbouring region has demonstrated this phenomenon[9,10].

In addition, essential healthcare services have been extensively interrupted by the floods, triggering outbreaks of pneumonia, diarrhea, and malaria among displaced children who lack access to care[11]. Status reviews indicate that the health crises from these disasters will have to be addressed with targeted health strategies as a priority, but also that healthcare infrastructure needs to be strengthened[12,13]. This includes both the response to the immediate emergency and the future prevention of climate health shocks in the longer term[14].

Experts urge substantial improvement in the preparation for future floods, wider and adequate disease surveillance systems, and clear public health interventions targeting vulnerable groups[15,16]. Enhanced health systems, wider accessibility of clean drinking water, and increased vaccination conditions should be established to safeguard the population from the health threats of climate change marital aids[17].

Displacement of vulnerable populations, particularly children during flood disasters in Pakistan increases the risk of adverse outcomes. With inadequate sanitation, malnourishment and lack of health care, internally displaced children are more exposed to diseases. Knowledge of the incidence and prevalence of these diseases in epidemics and pandemics are important for decision-making regarding the possibility of implementation of targeted interventions, the allocation of financial and human resources, and for improvement of health outcomes in strong disruption of the health system in such events.

Corresponding Author
Allah Bux Bhutto
Email: allahbuxbhutto1@gmail.com

Affiliations:
Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU), Children's Hospital, Larkana

Postgraduate Trainee[1,4,5,6,7,8,9,10]

Professor & Chairman of the Pediatric Medicine Department[2]

Assistant Professor of Pediatric Medicine[3]

Submitted: September 13, 2024
Revised: November 20, 2024
Accepted: November 21, 2024

METHODOLOGY

This descriptive cross-sectional study was conducted in the Department of Pediatrics at Shaheed Mohtarma Benazir Bhutto Medical University (SMBBMU) Larkana from July 2022 to March 2023 to assess the disease patterns in internally displaced children registered during flood disasters, visiting a tertiary care hospital in Larkana. The study was a cross-sectional study, and in total, 507 children participated through non-probability purposive sampling. We calculated a sample size from the Open EPI online sample size calculator (www.OpenEPI.com) using a 13.33% frequency of pneumonia in internally displaced children, from pilot data, a 3% margin of error, and a 95% level of confidence. This study included both genders of internally displaced flood victims, aged 6 months up to 15 years were included in the study. Children with congenital heart disease or congenital anomaly, chronic respiratory illnesses (e.g., asthma, cystic fibrosis) or other chronic conditions that could mimic or confound infectious disease presentations were excluded from the study. Subjects who fulfilled the inclusion criteria were included in the study after written informed consent was obtained from parents/guardians. They were assured of the confidentiality of the information, their right to withdraw from the study at any time without providing a reason and were informed in simple and understandable language about the purpose and nature of the study.

Children with high-grade fever (>101°F) accompanied by symptoms such as headache, body aches, nausea, and rash were diagnosed with dengue fever following confirmation through a positive dengue virus antigen test in blood. Identification of malaria in children with fever, chills and shivering was defined by positive malaria parasite immunochromatographic test (MP ICT). Pneumonia was defined as a cough or difficulty breathing of less than four weeks duration, elevated respiratory rate (>50/min for children aged 2–11 months or >40/min for children aged 12–59 months), or lower chest wall in-drawing on clinical examination, with supporting evidence of consolidation or infiltrates on chest x-ray.

SPSS version 26.0 was used to analyze the collected data. Descriptive statistics were calculated in terms of Mean ± Standard Deviation and frequency with percentage. The Chi-square test was applied to assess the statistical significance at 5% level of significance.

RESULTS

Table I shows that the participants' mean age was 4.085 ± 2.9637 years, and balanced distribution of study population in two age groups (0.5–4 years, 54.6% vs 4.1–15 years, 45.4%). Gender distribution showed, 51.7% male and 48.3% female. The majority of the mothers had no education (40.2%) followed by primary education (33.5%), secondary (13.4%) and tertiary education (12.8%). The distribution of family monthly income of households showed that 179 (35.3%) had a low monthly income, 170 (33.5%) had a medium monthly income, and 158 of the respondents (31.2%) belonged to high-income households, which indicate that the socio-economic distribution was skewed towards lower-income groups. The overwhelming majority of the study subjects lived in Kacha houses (68.6%), demonstrating inadequate housing status and majority of the subject's (63.7%) utilized unimproved drinking water sources which can be an integral risk factor for waterborne diseases.

The analysis of disease patterns among men and women were mentioned in **Table II**, rates for most diseases were nearly identical between both genders, with statistically significant differences being only in respect of pneumonia. Males had a higher rate of pneumonia than females (74.8% compared to 65.7%), with a p value of 0.025, and OR of 1.549. This indicates that men were roughly 1.5 times more likely as women to contract the pneumonia. Males suffer from malaria with the rate of (54.6%), females (53.1%), yet no statistically significant difference was seen here (P=0.732). Similarly, like Dengue fever (males: 24.4%, females: 26.1%), chikungunya (males: 14.9%, females: 14.7%) and typhoid fever (males: 24.4%, females: 24.1%) also had no evident gender variations at all in numbers of sufferers. Only in diseases such as gastroenteritis was there any conspicuous difference between the sexes: women, 56.3% of them, are more liable to get this than men (63.7%). But even so, the difference in numbers was not great enough to reach statistical significance (P=0.088). Skin diseases and diarrhea show almost equal distribution in males and females, having p values of 0.714 and 0.472, respectively.

In **Table III**, comparing disease patterns between the two age groups (0.5–4 and 4.1–15 years), several conditions showed extreme differences. This suggests an age-related pattern. Younger children (0.5–4 years) had a significantly higher rate of malaria than older children. The incidence of malaria among the children between the age group (0.5—4) years was 58.8% and (4.1---15) years was 47.8%, and p value was found to be as 0.013. This is equivalent to odds ratio 1.560 which indicates that the odds of having malaria in younger children 1.56 times more likely in younger age as compared to older children. Similarly, the prevalence of gastroenteritis was significantly high in the younger age group (65.7% v/s 53.5%; p= 0.005). Diarrhea was significantly more prevalent in younger children as compared to older ones (84.5% v/s 71.3%, p=0.0001, OR=2.190). Consequently, these findings suggest that younger children literally have twice the chances of suffering from diarrhea as compared to older ones. Pneumonia was also significantly more common in the younger group (75.5% vs. 64.3%, p=0.006, OR=1.703), indicating their greater risk of respiratory infections. Conversely, for the older group (4.1-15 years), there was a significantly higher prevalence of skin diseases than the younger age children. This is demonstrated by the fact that prevalence was 60.0% in older as opposed to just under a quarter (24.9%) for younger ones (p=0.0001). Dengue fever and chikungunya did not show significant differences of any kind between the age groups. The P values for these two diseases were noted as p=0.848 and p=0.130, respectively. Similarly, we found insignificant differences in the prevalence of typhoid fever between younger (23.1%) and older children (25.7%, p=0.505).

Table I: Demographic Characteristics of Study Participants (n=507)	
Variable	**n (%)**
Age (Mean ± SD) = 4.085 ± 2.9637 years	
0.5 – 4.0 years	277 (54.6)
4.1 – 15.0 years	230 (45.4)
Gender	
Male	262 (51.7)
Female	245 (48.3)
Mother's Education	
No education	204 (40.2)
Primary	170 (33.5)
Secondary	68 (13.4)
Higher	65 (12.8)
Family's Monthly Income	
Low	179 (35.3)
Medium	170 (33.5)
High	158 (31.2)
Type of House	
Kacha	348 (68.6)
Pakka	159 (31.4)
Source of Drinking Water	
Improved	184 (36.3)
Unimproved	323 (63.7)

Table II: Comparison of Diseases Pattern with Gender (n=507)				
Diseases Pattern	**Gender**			**P-Value**
	Male	**Female**	**O.R 95% C. I**	
Malaria, n (%)	143 (54.6)	130 (53.1)	1.063 (0.750 ---- 1.508)	0.732
Dengue Fever, n (%)	64 (24.4)	64 (26.1)	0.914 (0.612 ---- 1.365)	0.661
Chikungunya, n (%)	39 (14.9)	36 (14.7)	1.015 (0.622 ---- 1.659)	0.952
Typhoid Fever, n (%)	64 (24.4)	59 (24.1)	1.019 (0.679 ---- 1.530)	0.928
Gastroenteritis, n (%)	167 (63.7)	138 (56.3)	1.363 (0.954 ---- 1.947)	0.088
Diarrhea, n (%)	209 (79.8)	189 (77.1)	1.168 (0.765 ---- 1.785)	0.472
Pneumonia, n (%)	196 (74.8)	161 (65.7)	1.549 (1.055 ---- 2.275)	0.025
Skin Diseases, n (%)	109 (41.6)	98 (40.0)	1.069 (0.750 ---- 1.523)	0.714

Table III: Comparison of Diseases Pattern with Age Group (n=507)				
Diseases Pattern	**Age Group (Years)**			**P-Value**
	0.5 to 4 (Years)	**4.1 to 15 (Years)**	**O.R 95% C. I**	
Malaria, n (%)	163 (58.8)	110 (47.8)	1.560 (1.097 ---- 2.219)	0.013*
Dengue Fever, n (%)	69 (24.9)	59 (25.7)	0.961 (0.643 ---- 1.437)	0.848
Chikungunya, n (%)	47 (17.0)	28 (12.2)	1.474 (0.890 ---- 2.442)	0.130
Typhoid Fever, n (%)	64 (23.1)	59 (25.7)	0.871 (0.580 ---- 1.308)	0.505
Gastroenteritis, n (%)	182 (65.7)	123 (53.5)	1.667 (1.164 ---- 2.386)	0.005*
Diarrhea, n (%)	234 (84.5)	164 (71.3)	2.190 (1.421 ---- 3.376)	0.0001*
Pneumonia, n (%)	209 (75.5)	148 (64.3)	1.703 (1.160 ---- 2.501)	0.006*
Skin Diseases, n (%)	69 (24.9)	138 (60.0)	0.221 (0.151 ---- 0.323)	0.0001*

* p-value < 0.005 is significant

DISCUSSION

The findings of current study highlight a new perspective to the incidence of disease among children displaced by flooding in Pakistan during the year 2022. Waterborne and respiratory diseases, such as diarrhea, pneumonia, and gastroenteritis were noted significantly high among younger children (0.5-4 years old). These findings concur with previous studies showing that children in this age group were more susceptible to infections due to their immature immune systems and heavy exposure to polluted water and unhygienic living conditions during times of displacement[5,7].

In comparison, older age groups (4.1 to 15 years old) had a higher prevalence of skin diseases, due to longer exposure to flood waters and lack of appropriate clean hygiene sites, which had been reported in previous studies[12,18]. Except for the higher incidence of pneumonia in males than females, gender-based differences were negligible between males and females, which is in agreement with what is already known about gender-based differences in respiratory infections[11,13].

This study demonstrates a high prevalence of various infectious diseases, which indicates considerable public health challenges. Malaria prevalence of 58.8% indicates the endemic nature of malaria with insufficient vector control, inadequate supply of antimalarial medicines and limited education campaigns in the community. Dengue was dominant in 24.9% of cases, in line with above regions endemic data, indicating the requirement of large-scale mosquito prevention and vaccination programs.

Chikungunya was found in 17.0% of the cases demonstrating a considerable disease burden with limited diagnostic accuracy and public awareness leading to suboptimal disease management. Typhoid fever was noted in 23.1% and documented as a leading cause of diarrheal disease which associated with continued problems with water quality and sanitation, indicating improvements are needed that provide access to clean water, hygiene and ongoing vaccination to mitigate these diseases.

The most common clinical manifestation was gastroenteritis involving 65.7% of cases which is again much higher than that reported by Ahmed Z, et al[19], having prevalence of only 30%. The above disparity may be due to regional variations in sanitation and food safety, highlighting the crucial need for hygiene education and food safety regulations. Diarrhea was found in 84.5% of patients, which was lower than the 91.5% prevalence by Wang P, et al[20] but significantly higher than the 7.02% observed by Saha J, et al[21]. Differences in demographics, geographic location, or methodologies could explain variations in prevalence. Focusing on sanitation improvements, access to clean water, and education on rehydration therapy to treat disorders like diarrhea are still critically important.

Pulmonary disease was heavily represented, with pneumonia being comorbid in 75.5% of cases. Increased vaccination coverage and prompt medical treatment is critical to mitigate its impact. Skin diseases were seen in 24.9% of the cases, while Ahmed Z, et al[19] reported a prevalence of 33% which might be due to difference and/or accessibility of healthcare in one region as compared to the other. Understanding the aetiologies and risk factors of skin infections can lead to targeted interventions.

Strengths of the study include its large, representative sample size and the focus on disease patterns that are pertinent to both gender and specific age-groups. Such an in-depth process allows for distinguishing between the specifications of health vulnerabilities as a result of disaster, making this an informative foundation for possible targeted interventions. Moreover, the combination of statistical measures such as odds ratios and confidence intervals consistently utilized within the study provides a reliable and significant contribution to disaster medicine.

Still, study has some significant limitations. The use of cross-sectional design limits the ability to draw cause and effect conclusions between displacement and disease outcomes. Furthermore, hospital-based data collection may cause

selection bias in that many children with uncomplicated symptoms or lacking healthcare access may not have been captured. This population also suffered from severe food insecurity and important socioeconomic factors were unfavorably skewed toward lower education and income levels. Such social determinants likely were some of the most salient pre-existing conditions in the spread and virulence of disease and should therefore be investigated within longitudinal studies.

To address the health risks highlighted by this study, it is recommended that disaster response strategies prioritize the healthcare needs of displaced children. Immediate measures should include ensuring access to clean drinking water, sanitation facilities, and routine healthcare services, such as immunizations and respiratory infection management. Strengthening disease surveillance systems in flood-prone regions is crucial for early outbreak detection and control. Long-term strategies must focus on improving infrastructure, promoting health education, and bolstering the resilience of healthcare systems to withstand the impacts of climate-induced disasters. Such interventions are essential to mitigate the long-term health consequences of displacement and to protect vulnerable populations from future environmental crises.

CONCLUSION

The findings of the current study show that younger internally displaced children were more susceptible to diarrhea, pneumonia, and gastroenteritis, while skin diseases were more common in older children. The risk of pneumonia was significantly high in younger children. Problems with housing, water, and socioeconomic status may have caused the observed patterns. These findings suggest targeting healthcare for younger children and improving living conditions for displaced populations.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil.

Authors' Contributions: All authors took part in this study to an equal extent. **Allah Bux B:** led the study's design, data collection, analysis, and manuscript preparation. **Shanti Lal B:** supervised the study and critically reviewed the manuscript. Nazia: supported data interpretation and revisions. **Suhail A, Paras, Sadam B, Rahmatullah T, Farooq I, Komal,** and **Noor:** contributed to data collection, literature review, and manuscript drafting. All authors reviewed the final manuscript.

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How to cite: Allah B, Shanti LB, Nazia, Suhail A, Paras, Sadam B, Rahmatullah T, Farooq I, Komal, Noor. Frequency of Diseases Patterns in Internally Displace Children During Flood Disasters at Tertiary Care Hospital Larkana. Pak J Med Dent Sci. 2024;1(2):45-50

MS No: PJMDS/OA/025/2024

Original Article

Evaluation of CHA_2DS_2-VASc Score to Predict Cardiogenic Shock in ST Elevation Myocardial Infarction (STEMI)

Juned Hyder[1], Parveen Akhtar[2], Muhammad Farhan Ali[3]

ABSTRACT

Objective: To evaluate the ability of the CHA_2DS_2-VASc score to predict the likelihood of cardiogenic shock in patients diagnosed with ST-elevation myocardial infarction (STEMI).

Methodology: The research was conducted at the Department of Cardiology, NICVD, Karachi, over the period from February 2023 and February 2024. A desciptive study design was employed. The study population included 531 patients diagnosed with STEMI, aged between 18 and 70 years, who presented withtin 24 hours of symptom onset. Participants were recruited using non-probability consecutive sampling. On clinical symptoms and ECG diagnosed STEMI[12] and patients who had past myocardial infarction, chronic kidney diseases, chronic liver diseases, heart failure and arrhythmias were excluded. Before PCI, we collected baseline demographic and clinical information and determined CHA_2DS_2-VASc scores. SPSS version 26.0 was used for data analysis.

Results: The mean±SD age of the individuals were found to be 57.05±11.283. Out of 531 participants 82.3% were male while 17.7% accounted for female. The CHA_2DS_2-VASc score effectively forecast cardiogenic shock in STEMI cases, alongside an AUC of 0.761 (p=0.0001). Cases with greater scores faced worse in-hospital outcomes, including a significantly higher mortality rate (9.6% compared to 1.5%, p=0.0001) and more frequent major cardiovascular events (14.4% vs. 5.4%, p=0.001). Their average ejection fraction was also lower (41.43% vs. 46.06%, p=0.0001).

Conclusion: It is to be concluded that CHA_2DS_2-VASc score offers practical insights into risk assessment for STEMI patients, especially in predicting the likelihood of cardiogenic shock. Patients with higher scores tended to have more severe health conditions and poorer outcomes during hospitalization. Using this score in clinical settings helps identify those who may benefit from closer observation and timely interventions.

Keywords: Area under the curve, Cardiogenic shock, CHA_2DS_2-VASc score, Hemodynamic complications, ST-segment elevation myocardial infarction,

INTRODUCTION

The CHA_2DS_2-VASc score is a recognised tool utilised to assess stroke risk in patients with atrial fibrillation. However, recent studies have demonstrated its applicability in predicting the clinical outcomes of patients with ST-elevation myocardial infarction (STEMI), particularly in assessing the risk of cardiogenic shock. This research is to evaluate the prediction accuracy and clinical relevance of the CHA_2DS_2-VASc score in the prediction of cardiogenic shock with cases having STEMI which is an important threat to the burden of disease worldwide.

High score CHA_2DS_2-VASc increase of cardiovascular event risk in patient STEMI on evidence-derived. For example, Sun et al. found that the CHA_2DS_2-VASc score was strongly predictive of in-hospital prognosis in primary PCI cases[1]. Huang et al. also observed that the CHA_2DS_2-VASc score is a reliable indicator of coronary artery disease and prognosis in individuals with acute STEMI[2].

Several studies reported the impact of the CHA_2DS_2-VASc score on cardiogenic shock. Fang et al. pointed out that cases with high CHA_2DS_2-VASc scores experienced a greater frequency of cardiovascular adverse events while in hospital[3]. This is crucial, since early recognition of at-risk individuals may provide timely therapies and enhance survival rates.

Corresponding Author
Juned Hyder
Email: drjuned.baloch@gmail.com

Affiliations:
National Institute of Cardiovascular Diseases
PGR FCPS Adult Cardiology[1]
Associate Professor[2]
Clinical Fellow[3]

Submitted: September 26, 2024
Revised: December 19, 2024
Accepted: December 20, 2024

Furthermore, as shown by Ashoori et al., CHA_2DS_2-VASc serves as an autonomous indicator of post-reperfusion and short-term fatalities subsequent to initial PCI[4]. These results highlight the potential utility of the score in the threat of STEMI patients possibly in need of more aggressive management approaches.

The CHA_2DS_2-VASc-HSF score represents important progress in risk stratification and has demonstrated a more accurate prediction of angiographic blood flow than having STEMI[5,6]. Such enhanced predictive capacity may be useful to clinicians to help guide appropriate treatment decisions in those patients at high risk of immediate shock during or following acute coronary events[7,8].

Modified versions of CHA_2DS_2-VASc score have also been used to predict hospital mortality and post-PCI complications after acute coronary syndrome[9,10]. More generally, the reliability of the CHA_2DS_2-VASc score extends beyond evaluating the risk of contrast nephropathy and hemorrhagic stroke associated with enhanced therapy[11,12]. These results indicate that in the clinical management of STEMI patients, the CHA_2DS_2-VASc score may have broader applicability.

CHA_2DS_2-VASc score appears to be an effective instrument in forecasting cardiogenic shock risk within STEMI cases that reaffirm their use as more than merely a tool for anticoagulation management[13,14]. The implementation of this score within healthcare settings may enhance decision-making processes and improve outcomes in individuals with STEMI[15,16].

METHODOLOGY

The research was carried out in the Cardiology department of National Institute of Cardiovascular Diseases (NICVD), Karachi, since February 2023 till February 2024. The study was carried out in the form of comparative descriptive cross-sectional design enrolling 531 patients, and the sample size

was determined through WHO sample size calculator, based on 5.87% frequency of cardiogenic shock in STEMI patients, margin of error (d)=2%, and confidence level (C.I)=95%. Patients with either gender aged 20—70 years with STEMI (attended within 3 hours of onset or less) and planned for primary percutaneous coronary intervention (PPCI) without any mechanical or surgical interventions (All patients treated with aspiration during PPCI after balloon dilatation) were enrolled using non-probability purposive sampling. In STEMI cases, acute myocardial infarction (AMI) was diagnosed according to clinical presentation and ECG findings, with classical chest pain lasting > 20 min (retrosternal pain radiating to the left arm or shoulder, aggravated by exertion or emotional stress) concurrent with ST segment elevation in two or more contiguous leads or new left bundle branch block. ST-segment elevation was defined as a J-point elevation of greater than 2 mm in leads V2 and V3, and ≥1 mm in other leads.

Patients with recurrent myocardial infarction were excluded, as were patients with chronic kidney disease or liver disease (defined as either chronic kidney disease or liver disease), and those with heart failure or who had arrhythmias (atrial fibrillation, ventricular tachycardia, ventricular fibrillation, or supraventricular tachycardia). Patients were stabilized and initial treatment provided upon their arrival in the Emergency Department (ED). Once stable, the study's purpose, risks, and benefits were explained, and written informed consent was obtained. Baseline demographic and clinical data, including age, gender, diabetes, hypertension and smoking status were obtained using a pre-designed proforma. STEMI was confirmed via ECG, and the CHA_2DS_2-VASc score was calculated before the PCI procedure.

All PCI procedures were performed by interventional cardiologists with more than five years of experience, and study covariates were meticulously recorded. The patients were all evaluated for cardiogenic shock depending on surviving hypotension (systolic blood pressure >18 mm Hg or RV end-diastolic pressure >10–15 mm Hg) Statistical data was assessed by SPSS version 26.0.

RESULTS

The baseline characteristics of the study participants are shown in **Table I**. Comparisons of characteristics between low and high CHA_2DS_2-VASc groups revealed significant differences in age, sex, and multiple comorbidities ($p < 0.05$ for all). The older (64.60 ± 9.79 years versus 54.72 ± 10.68 years; p=0.0001) high CHA_2DS_2-VASc (0-1 versus ≥ 2) group The low score group had a higher percentage of males (91.1% vs 53.6%, p=0.0001) and less congestive heart failure, hypertension, diabetes mellitus, stroke, peripheral artery disease, CABG surgery history, MI history, and PCI history compared with the high score group (p<0.05 for each). A higher number of current smokers were observed in the low score group (80.8% vs. 39.2%, p=0.0001); however, hyperlipidemia was much higher in the high score group (36.0% vs 20.9%, p=0.001). A much greater Killip Score I was also present in the high CHA_2DS_2-VASc group (16.8% vs. 5.9%, p=0.0001). The door-to-balloon time was significantly longer in the high score group (35.54 ± 6.28 hours vs. 32.56 ± 5.91 hours, p=0.0001); however, the pain-to-balloon time, systolic blood pressure, heart rate, and length of hospital stay showed no significant differences between both groups (p>0.05). The CHA_2DS_2-VASc score was found to be significantly elevated for the high score group (3.528 ± 0.963 vs. 0.815 ± 0.732, p=0.0001).

Table II: In-hospital outcomes of the low and high CHA_2DS_2-VASc score groups (low: n=406, high: n=125). In the high CHA_2DS_2-VASc group, in-hospital mortality was significantly higher (9.6% vs. 1.5%, p=0.0001). Those with high scores also experienced significantly more major adverse cardiovascular events (MACE) (14.4% vs. 5.4%, p=0.001). We noted a higher rate of hemodialysis (4.0% vs. 0.7%, p=0.020) and transient pacemaker use (9.6% vs. 1.5%, p=0.0001) in the high-score group. In terms of red cell transfusion, the low-score group had a higher rate (5.6% vs. 1.5%, p=0.009). No differences were found in reinfarction, target vessel revascularization (TVR), cardiopulmonary resuscitation, intra-aortic balloon pump (IABP) use, cardiogenic shock, atrial fibrillation and femoral artery pseudoaneurysm between the groups (p>0.05 for all) In addition, the mean ejection fraction was also significantly lower in the high CHA_2DS_2-VASc group (41.43 ± 4.60% vs. 46.06 ± 7.71%, p=0.0001).

The CHA_2DS_2-VASc score is predictive of cardiogenic shock (AUC 0.761), as shown in **Figure I**. An AUC value of this level suggests that it has good discriminatory ability such that the CHA_2DS_2-VASc score effectively separates patients at high vs low risk for cardiogenic shock. In addition, a very low p-value of < 0.0001 supports the statistical significance of the association and suggests that the CHA_2DS_2-VASc score may be a valid predictor of cardiogenic shock in patients with ST-elevation myocardial infarction (STEMI).

In-hospital mortality predicted by CHA_2DS_2-VASc score in **Figure II**. An AUC of 0.874 reflects excellent discriminatory ability, suggesting that the CHA_2DS_2-VASc score is a very good predictor of in-hospital mortality. The p-value of 0.0001 further confirms that this is a highly statistically significant result and highlights the strength of the CHA_2DS_2-VASc score in predictive mortality. The score can discriminate between patients at risk of in-hospital death and those not in need of intensive monitoring and care with an AUC of 0.874.

Table I: Baseline Characteristics of Study Participants (n=531)				
Variables		**CHA_2DS_2-VASc**		**P-Value**
		Low (n=406)	**High** (n=125)	
Age in years, Mean ± SD		54.72 ± 10.68	64.60 ± 9.79	0.0001
Gender	Male, *n* (%)	370 (91.1)	67 (53.6)	0.0001
	Female, *n* (%)	36 (8.9)	58 (46.4)	
Congestive Heart Failure, *n* (%)		3 (0.7)	9 (7.2)	0.0001
Hypertension, *n* (%)		120 (29.6)	110 (88.0)	0.0001
Diabetes Mellitus, *n* (%)		66 (16.3)	68 (54.4)	0.0001
Stroke, *n* (%)		3 (0.7)	10 (8.0)	0.0001
Peripheral Artery Disease, *n* (%)		6 (1.5)	12 (9.6)	0.0001
CABG Surgery History, *n* (%)		9 (2.2)	12 (9.6)	0.0001
MI History, *n* (%)		34 (8.4)	27 (21.6)	0.0001
PCI History, *n* (%)		36 (8.9)	31 (24.8)	0.0001
Anterior MI, *n* (%)		189 (46.6)	60 (48.0)	0.777
Current Smoker, *n* (%)		328 (80.8)	49 (39.2)	0.0001
Hyperlipidemia, *n* (%)		85 (20.9)	45 (36.0)	0.001
Killip Score I, *n* (%)		24 (5.9)	21 (16.8)	0.0001
Door-to-Balloon Time (hours), Mean ± SD		32.56 ± 5.91	35.54 ± 6.28	0.0001
Pain-to-Balloon Time (hours), Mean ± SD		212.18 ± 90.36	221.97 ± 83.07	0.281
Systolic Blood Pressure (mm Hg), Mean ± SD		125.57 ± 15.79	122.30 ± 20.60	0.061
Heart Rate (bpm), Mean ± SD		78.48 ± 6.45	77.42 ± 9.37	0.153
Length of Hospital Stay (day), Mean ± SD		7.35 ± 4.53	8.04 ± 4.07	0.127
CHA_2DS_2-VASc, Mean ± SD		0.815 ± 0.732	3.528 ± 0.963	0.0001

***CABG**: Coronary Artery Bypass Graft; **MI**: Myocardial Infarction, **PCI**: Percutaneous Coronary Intervention*

Table II: Comparison of In-Hospital Outcomes Between Low and High CHA_2DS_2-VASc Score (n=531)				
Variables	**CHA_2DS_2-VASc**			**P-Value**
	Low (n=406)	**High** (n=125)	**95% C. I**	
In-Hospital Mortality, *n* (%)	6 (1.5)	12 (9.6)	0.052 --- 0.385	0.0001
Reinfarction, *n* (%)	9 (2.2)	4 (3.2)	0.208 --- 2.266	0.366
TVR, *n* (%)	14 (3.4)	4 (3.2)	0.349 --- 3.344	0.577
MACE, *n* (%)	22 (5.4)	18 (14.4)	0.176 --- 0.658	0.001
Hemodialysis, *n* (%)	3 (0.7)	5 (4.0)	0.042 --- 0.758	0.020
Cardiopulmonary Resuscitation, *n* (%)	21 (5.2)	10 (8.0)	0.287 --- 1.370	0.238
IABP, *n* (%)	9 (2.2)	6 (4.8)	0.157 --- 1.289	0.127
Cardiogenic Shock, *n* (%)	18 (4.4)	11 (8.8)	0.221 --- 1.047	0.060
Atrial Fibrillation, *n* (%)	9 (2.2)	6 (4.8)	0.157 --- 1.289	0.127
Transient Pacemaker, *n* (%)	6 (1.5)	12 (9.6)	0.052 --- 0.385	0.0001
Femoral Artery Pseudoaneurysm, *n* (%)	15 (3.7)	7 (5.6)	0.258--- 1.623	0.350
Red Cell Transfusion, *n* (%)	6 (1.5)	7 (5.6)	0.083 --- 0.767	0.009
Ejection Fraction (%), Mean ± SD	46.06 ± 7.71	41.43 ± 4.601	3.201 --- 6.058	0.0001

***CV**: Cardiovascular, **IABP**: Intra-Aortic Balloon Pump, **MACE**: Major Advanced Cardiac Events, **TVR**: Target Vessel Revascularization*

Figure 1: Predictive Value of the CHA_2DS_2-VASc Score for Cardiogenic Shock

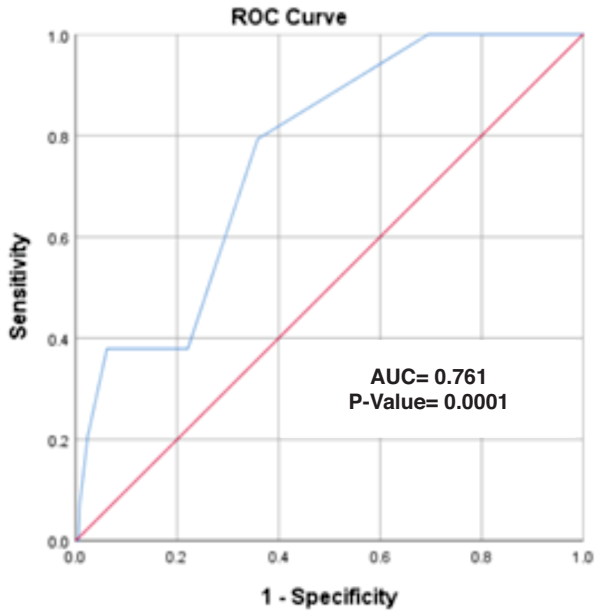
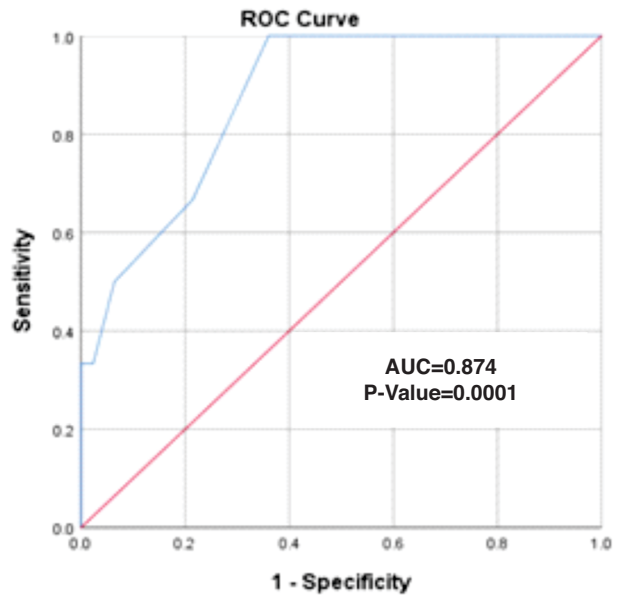


Figure 2: Predictive Value of the CHA_2DS_2-VASc Score for In-Hospital Mortality



DISCUSSION

The CHA_2DS_2-VASc score is a validated measure for thromboembolic risk stratification in atrial fibrillation patients; however, its effectiveness in predicting cardiogenic shock in STEMI patients has not been well investigated[17]. The present investigation indicated a robust correlation between elevated CHA_2DS_2-VASc scores and incidences of cardiogenic shock. The score has a moderate ability to identify at risk patients as shown by AUC 0.761. Additionally, those with high scores had worse clinical outcomes, such as lower ejection fractions and a higher Killip Class. These results underscore the impact of systemic comorbidities, including older age, diabetes, and hypertension, on the development of cardiogenic shock during acute myocardial ischemia.

The current study expands on prior work demonstrating that the CHA_2DS_2-VASc score also predicts a range of cardiovascular events beyond stroke[4,5]. A research performed by Fang et al. achieved an AUC of 0.744 in the prediction of major adverse cardiovascular events (MACE) with a 3.5 cut-off score[3]. Similarly, Huang et al. found a higher cut-off of 4.5 with an AUC of 0.947 for MACE[2]. Additionally, Bozbay et al. CHA_2DS_2-VASc score effectively predicted long-term mortality in STEMI populations[18], with AUC=0.821. Although these studies mainly associated the score with MACE and mortality, our study contributes new insights about the association between this score and cardiogenic shock after STEMI, a less commonly examined complication. This study highlights the CHA_2DS_2-VASc score as a simple risk stratification tool that could be applied in more widely clinical settings.

However, there are limitations of applying the CHA_2DS_2-VASc score in the prediction of cardiogenic shock[19,20]. Essential differences exist between this diagnostic tool and STEMI-specific tools, it does not consider important aspects including infarct size, reperfusion status and left ventricular function[21]. This may be the reason the score provides only moderate predicting power in this setting, with these components are crucial in determining the risk of cardiogenic shock for the patient. Incorporating these STEMI-specific variables into the CHA_2DS_2-VASc may improve its accuracy and clinical applicability and should be the aim of future work.

A significant feature of this research is its emphasis on the applicability of the CHA_2DS_2-VASc score. Its dependence on routinely collected experimental data renders it feasible and transferrable into practice, including resource-limited healthcare settings. This study also uses the score to identify STEMI patients who may be at risk of developing cardiogenic shock and thereby extends its utility beyond thromboembolism risk evaluation. Enabling doctors to detect high-risk people sooner and act more effectively and promptly, clinicians will be able to influence outcomes with greater success than is possible today in more vulnerable patients.

Nevertheless, some limitations must be considered. The lack of any STEMI—specific factors limits the usefulness of the score in cardiogenic shock. The generalizability of these findings should be confirmed in larger and more diverse populations including non-STEMI. The CHA_2DS_2-VASc score more effectively forecasts ischaemic stroke in patients with STEMI and should be adjusted by adding specific parameters to further enhance its goodness of fit and its prediction ability in future studies, which might include external validation in low-income settings.

The CHA_2DS_2-VASc score is a useful predictive tool of STEMI risk stratification, especially for identifying patients who are at risk for developing post-STEMI cardiogenic shock. Although its simplicity and practicality are important advantages, the addition of other clinical variables would improve its performance and accuracy. These advancements would help healthcare workers better identify high-risk patients and provide more precise, impactful care.

CONCLUSION

It is to be concluded that the CHA_2DS_2-VASc score offers practical insights into risk assessment for STEMI patients, especially in predicting the likelihood of cardiogenic shock. Patients with higher scores tended to have more severe health conditions and poorer outcomes during hospitalization. Using this score in clinical settings helps identify those who may benefit from closer observation and timely interventions.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contributions: All authors took part in this study to an equal extent. **Juned H:** Contributed to the conception of the study, data collection, and initial manuscript drafting. **Parveen A:** Supervised the entire study, provided critical revisions, and offered expert guidance throughout the research process. **M Farhan A:** Was responsible for data analysis, interpretation of results, and the final review of the manuscript to ensure its accuracy and completeness.

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How to cite: Juned H, Parveen A, M Farhan A, Aneeta, Pooja. Evaluation of CHA_2DS_2-VASc Score to Predict Cardiogenic Shock in St Elevation Myocardial Infarction (STEMI). Pak J Med Dent Sci. 2024;1(2):51-55

MS No: PJMDS/OA/027/2024

Original Article

Indications and Complications of Intestinal Stoma Formation

Amber Afaque[1], Dileep Kumar[2], Adeel Alam Durrani[3], Mazhar Iqbal[4], Sunil Dut Sachdev[5], Muhammad Naeem[6], Namra Baig[7], Shabina Jaffar[8], Fareha Farooq[9], Nighat Ghias[10]

ABSTRACT

Objective: To determine the frequency of indications and complications of intestinal stoma formation in patients undergoing stoma surgery.

Methodology: A descriptive cross-sectional study was carried out in the Department of General Surgery, JPMC, Karachi, Pakistan, between April 2022 and April 2023. A total of 120 participants, aged 20–60 years with ASA classifications I–III, were enrolled through non-probability purposive sampling. Postoperative complications, including skin excoriation, stomal bleeding, retraction, wound infections, and parastomal hernia, were documented. Statistical analysis was conducted using SPSS version 26.0, with results analyzed at a 5% level of significance.

Results: The participants had an average age of 39 years, with a standard deviation of 12.6 years among them 60.8% were male and 39.2% female. Abdominal trauma was noted in 21.8% of younger patients and 28.6% of older ones (p = 0.408). Similarly, abdominal sepsis occurred in 10.7% of elective cases versus 3.3% in emergency cases (p = 0.139), and anastomotic leaks were nearly identical at 3.6% for elective and 3.3% for emergency procedures (p = 0.660). However, postoperative complications varied, with intestinal obstruction being significantly higher in older patients (16.7% compared to 5.1% in younger patients, p = 0.042). Additionally, parastomal hernias were more common in older patients, showing a borderline difference (9.5% vs. 1.3%, p = 0.050).

Conclusion: The research highlights gastrointestinal cancers and abdominal injuries as the primary reasons for intestinal stoma formation, with most cases stemming from emergency surgeries. Complications like intestinal blockage, skin irritation, and stoma retraction were more prevalent, particularly in older individuals. These findings underscore the importance of careful planning before surgery and attentive care afterward to reduce risks.

Keywords: Complications, Enteric perforation, Intestinal stoma, Stoma formation indications, Wound infection

INTRODUCTION

The intestinal stoma are openings that are surgically created in the abdomen that allow waste to get out of the body. While stoma can significantly improve the quality of life for many patients, they can also lead to various complications. Understanding the indications for the formation of stoma and complications rates is essential for healthcare professionals.

The indications for the creation of a stoma include intestinal obstruction, cancer, inflammatory intestinal disease and trauma. Massenga et al. reported on these indications both in adults and in children, underlining that the stoma are commonly used in contexts limited to resources in which complex surgical interventions may not be immediately available[1]. After surgery, patients may experience complications such as infections, losses and skin irritation. For example, Pal et al. analyzed the management of abdominal stoma and highlighted a series of complications, including peristomic leather problems[2].

The complications associated with intestinal stoma are not rare. Each patient is unique, and several factors related to the patient can influence these complications. According to Zelga et al., factors such as age, the index of body mass and the presence of conditions of comorbidities can contribute to post-operative complications[3]. Additionally, D'Ambrosio et al. argued that skin peristomic complications are common and demand targeted support strategies to reduce their incidence[4].

Equally, the stoma site must be marked preoperatively. Arolfo et al. noted that marking the stoma sites in the first spring reduces the stoma complications[5]. This continues to even further highlight the requirement for proper pre-intervention planning to ensure improved outcomes. Complications may also include hospital readjusts and the rise in expenditure of care[6].

Stoma formation timing is one more influential point. As Dincer has said, the incidence of complications is often much higher after emergency correction than after planned surgical intervention[7]. For an emergency intestinal stoma, one study noted that the frequency of complications was considerably higher within the first days following the procedure[8].

Either surgical or post-operative care, can impact results after stoma formation, a different study recognized that complications after emergency intestinal stoma were significantly related to risk factors and approved skilled surgical techniques contribute to the recovery of patients[9].

Intestinal stoma provides both opportunities and challenges for care and practice. Identifying the indications accurately and managing the complications proactively are the key factors. The current research underlines the need for doctors to be aware of the patient factors that influence results and support standard practices such as the marking of the preoperative site. Continuous education on the care of the stoma can improve the quality of life for patients after intervention[10-12]. A study reported indications of intestinal stoma formation as gastrointestinal malignancy (25%) and abdominal trauma (22%)[13]. While complication of intestinal stoma formation was reported as wound infection (8.5%), skin excoriation (52.4%), stoma

Corresponding Author
Amber Afaque
Email: amberafaque59@hotmail.com

Affiliations:
Associate Professor, Jinnah Postgraduate Medical Centre[2,4,6]
Senior Registrar[8]

General Surgeon[7]

Postgraduate Trainee[1, 3, 9]

Liaquat College of Medicine and Dentistry
Assistant Professor[5]

Sindh Employees Social Security Institute Karachi
Consultant General Surgeon[10]

Submitted: September 27, 2024
Revised: December 13, 2024
Accepted: December 14, 2024

retraction (8.5%)[13]. Formation of intestinal stoma is widely performed with surgical procedure worldwide. It is associated with variable complications which can impact physical and mental health of the patient[14,15]. By understanding the complexities involved, health workers can help guarantee better results for people who live with the stoma.

METHODOLOGY

A descriptive cross-sectional study was conducted in the Department of General Surgery, JPMC, Karachi, Pakistan, from April 2022 to April 2023 to investigate the indications and complications associated with intestinal stoma formation in patients undergoing ileostomy or colostomy. Intestinal stomas were defined as the surgical exteriorization of the ileum (ileostomy) or colon (colostomy) through the abdominal wall onto the skin surface and were evaluated through clinical assessment. The sample size of 120 patients was determined using a wound infection prevalence of (8.5%)[13], a margin of error of 5%, and a confidence level of 95%. The study utilized a non-probability purposive sampling method. Patients between age group 20–60 years of either gender with ASA classifications I, II, or III undergoing stoma surgery were included, while those undergoing redo procedures, primary repairs, or those with metastatic disease, coagulation disorders, or surgeries performed at other facilities were excluded.

Stoma formation was indicated in a variety of clinical conditions. These included blunt abdominal trauma, which refers to injury caused by blunt forces affecting the abdomen, identified through clinical evaluation, imaging, or surgical findings; anastomotic leaks, defined as a failure at the surgical connection between two hollow organs, resulting in leakage of their contents, typically confirmed by imaging or during surgery; and congenital abnormalities, which are structural or functional defects present from birth, detected through clinical or radiological assessment.

Other conditions included enteric fever, a systemic illness caused by Salmonella bacteria, presenting with fever and abdominal pain, diagnosed through blood or stool cultures; enterocutaneous fistulas, abnormal passages linking the intestinal tract to the skin, identified via clinical examination and imaging studies; and gastrointestinal cancers, malignancies arising within the digestive tract, confirmed through imaging or histopathological analysis.

Other clear-cut indications were hollow viscus perforation (full thickness defect in the wall of a hollow organ in abdomen visualized on imaging or surgery), mesenteric ischemia (blood supply to the intestines is compromised visualized on clinical imaging or during surgery), and necrotizing pancreatitis (a serious inflammatory condition of the pancreas characterized by pancreatic necrosis with or without inflammation, on general imaging and clinically).

Finally, strangulated hernias (a form of an inguinal or femoral hernia with impaired supply of blood to the involved tissue) were diagnosed based on clinical symptoms of ischemia (especially when in need of surgical treatment), or as seen at the time of surgery, abdominal tuberculosis (an infection of the abdomen caused by the bacteria Mycobacterium tuberculosis) was diagnosed based on clinical judgment or upon imaging or other microbiological examination such as GeneXpert.

After research personnel provided a description of study risks and benefits and obtained written informed consent from study participants or their legal representatives, individual data collection began. All subjects had complete clinical histories and physical examinations, demographic data (age, sex, weight, height, and BMI) were recorded. Relevant laboratory tests and imaging studies were requested, and all patients underwent pre-anesthetic evaluation. Surgical indications were thoroughly documented by the hospital's surgical team.

After surgery, patients were monitored closely to identify and address any potential complications. Other complications seen were skin excoriation (damage due to persistent contact with fecal matter), stomal bleeding (bleeding at the stoma margins), and stoma retraction (stoma that lies below the level of the abdominal wall, noted clinically). Wound infections were identified through symptoms such as a fever above 100°F, pain rated over 4 on the Visual Analog Scale (VAS), redness, swelling, and the presence of pus. Another complication, parastomal hernia, was noted when abdominal contents protruded through the stoma site. Intestinal obstruction was diagnosed based on symptoms like abdominal bloating, frequent vomiting (more than three episodes), nausea, severe abdominal pain rated above 7 on the VAS, absence of stool or gas, and imaging results showing dilated bowel loops.

Other conditions monitored included burst abdomen, which refers to the separation of wound edges in the abdominal area, identified through clinical or radiological findings. Enterocutaneous fistula, characterized by an abnormal passage between the intestines and skin, was confirmed through examination and imaging. Mucosal prolapse, where the inner lining of the intestine extends out through the stoma, was diagnosed based on direct observation. Stomal diarrhea, defined as excessive, watery output from the stoma beyond normal levels, was assessed using clinical measures. Stomal necrosis, the death of tissue around the stoma, was identified by dark discoloration and tissue non-viability upon examination. Stomal prolapse, where the bowel protrudes more than usual through the stoma, and stomal stenosis, a narrowing of the stoma that restricts output, were diagnosed during physical examination and confirmed with imaging when necessary.

Daily assessments were conducted during hospitalization to promptly manage complications, with follow-ups scheduled for the 14th and 28th days after discharge. Contact information was collected from patients to ensure compliance with follow-up visits. The study design minimized potential biases by adhering to strict inclusion criteria and applying stratification techniques to address confounding variables.

The SPSS version 26.0 was used to evaluate the statistical data. Descriptive statistics were calculated and reported in terms of mean ± standard deviation with frequency and percentage as where applicable. The Chi-square test was applied to assess the statistical difference at 5% level of significance.

RESULTS

The study included 120 participants, with an average age of 39 ±12.6 years. Most participants (65%) were aged between 20 and 40 years, while the remaining 35% were older than 40. The duration of stoma placement averaged 2.6 months (±1.95). A majority of patients (78.3%) had their stoma for 1 to 3 months, while 21.7% had it for longer than 3 months. The mean hospital stay was 15.2 days (±4.57), with 62.5% of patients staying between 8 and 15 days, and 37.5% staying beyond 15 days. Regarding BMI, the mean value was 25.95 kg/m² (±3.54). About 62.5% of the participants had a BMI within the range of 20 to 26 kg/m², while 37.5% had a BMI above 26 kg/m². The group comprised 60.8% males and 39.2% females. Emergency

procedures were the most common, accounting for 76.7% of cases, with elective surgeries making up 23.3% (as outlined in Table I).

Table II presents the differences in surgical indications between the two age groups, which were found to be statistically insignificant. Among participants aged 20–40 years, 5.1% underwent surgery for abdominal sepsis, compared to 4.8% in the older group (p = 0.649). Similarly, 21.8% of younger patients and 28.6% of older patients had surgery for abdominal trauma (p = 0.408). For anastomotic leaks, 2.6% of patients in the younger group and 4.8% in the older group were affected (p = 0.437). Congenital anomalies were observed in 3.8% of younger participants and 4.8% of older ones (p = 0.575). Enteric fever was reported in 7.7% of younger patients and 11.9% of older patients (p = 0.446). Other conditions, such as enterocutaneous fistulas (5.1% vs. 7.1%, p = 0.469), gastrointestinal malignancies (21.8% vs. 33.3%, p = 0.168), hollow viscus perforation (15.4% vs. 14.3%, p = 0.872), mesenteric ischemia (2.6% vs. 2.4%, p = 0.720), necrotizing pancreatitis (1.3% vs. 7.1%, p = 0.123), strangulated hernia (5.1% vs. 9.5%, p = 0.288), and abdominal tuberculosis (6.4% vs. 11.9%, p = 0.299), showed no significant differences between the two groups.

Table III compares surgical indications for elective versus emergency procedures. Abdominal sepsis was more common in elective surgeries, affecting 10.7% of cases, compared to 3.3% in emergency procedures (p = 0.139). Abdominal trauma accounted for 26.6% of elective surgeries and 22.8% of emergency cases (p = 0.534). Anastomotic leaks were reported in 3.6% of elective procedures and 3.3% of emergency surgeries (p = 0.660). Congenital anomalies were observed in 7.1% of elective cases and 3.3% of emergency cases (p = 0.331). Enteric fever was seen in 7.1% of elective surgeries and 9.8% of emergency cases (p = 0.503). Other conditions, including enterocutaneous fistulas (10.7% vs. 4.3%, p = 0.205), gastrointestinal malignancies (28.6% vs. 25.0%, p = 0.705), hollow viscus perforation (7.1% vs. 17.4%, p = 0.151), mesenteric ischemia (3.6% vs. 2.2%, p = 0.553), necrotizing pancreatitis (3.6% vs. 3.3%, p = 0.660), strangulated hernia (14.3% vs. 4.3%, p = 0.085), and abdominal tuberculosis (10.7% vs. 7.6%, p = 0.425), also showed no significant differences between the two groups.

Table IV summarizes postoperative complications between the younger and older groups. Intestinal obstruction was significantly more frequent in patients over 40 years (5.1% vs. 16.7%, p = 0.042). Parastomal hernia showed a borderline significance, affecting 1.3% of younger patients and 9.5% of older ones (p = 0.050). Other complications, such as burst abdomen (1.3% vs. 2.4%, p = 0.579), enterocutaneous fistula (1.3% vs. 4.8%, p = 0.280), wound infection (5.1% vs. 11.9%, p = 0.163), mucosal prolapse (7.7% vs. 4.8%, p = 0.423), skin excoriation (51.3% vs. 50.0%, p = 0.893), stomal diarrhea (1.3% vs. 4.8%, p = 0.280), stomal necrosis (5.1% vs. 4.8%, p = 0.649), stomal prolapse (5.1% vs. 7.1%, p = 0.469), stomal retraction (10.3% vs. 14.3%, p = 0.512), and stomal stenosis (2.6% vs. 4.8%, p = 0.437) and stomal bleeding (2.6% vs. 7.1%, p = 0.231), did not differ significantly.

Table V compares complications based on the type of surgery. While not statistically significant, wound infections and mucosal prolapse were slightly more common in elective surgeries (14.3% vs. 5.4%, p = 0.128; 14.3% vs. 4.3%, p = 0.085). Other complications, including burst abdomen (3.6% vs. 1.1%, p = 0.414), enterocutaneous fistula (3.6% vs. 2.2%, p = 0.553), intestinal obstruction (7.1% vs. 9.8%, p = 0.503), parastomal hernia (7.1% vs. 3.3%, p = 0.331), skin excoriation (46.4% vs. 52.2%, p = 0.594), stomal diarrhea (3.6% vs. 2.2%, p = 0.553), stomal necrosis (7.1% vs. 4.3%, p = 0.428), stomal prolapse (10.7% vs. 4.3%, p = 0.205), stomal retraction (14.3% vs. 10.9%, p = 0.420), stomal stenosis (3.6% vs. 3.3%, p = 0.660) and stomal bleeding (10.7% vs. 2.2%, p = 0.082), showed no significant differences between elective and emergency surgeries.

Table I: Demographic Characteristics of Study Participants (n=120)

Variable	n (%)
Age (Mean ± SD) = 39.20 ± 12.61	
20-40 years	78 (65.0)
>40 years	42 (35.0)
Duration of stoma (Mean ± SD) = 2.58 ± 1.95	
1-3 months	94 (78.3)
>3 months	26 (21.7)
Duration of Hospital Stay (Mean ± SD) = 15.24 ± 4.57	
8-15 days	75 (62.5)
>15 days	45 (37.5)
Body Mass Index (Mean ± SD) = 25.95 ± 3.54	
20-26 kg/m^2	75 (62.5)
>26 kg/m^2	45 (37.5)
Gender	
Male	73 (60.8)
Female	47 (39.2)
Mode of Surgery	
Elective	28 (23.3)
Emergency	92 (76.7)

Table II: Comparison of Indications with Age Group (n=120)				
Indications	**Age Group**			**P-Value**
	20--40	**>40**	**O.R 95% C. I**	
Abdominal Sepsis, *n* (%)	4 (5.1)	2 (4.8)	1.081 (0.190----6.162)	0.649
Abdominal Trauma, *n* (%)	17 (21.8)	12 (28.6)	0.697 (0.295----1.644)	0.408
Anastomotic Leak, *n* (%)	2 (2.6)	2 (4.8)	0.526 (0.071----3.877)	0.437
Congenital Anomalies, *n* (%)	3 (3.8)	2 (4.8)	0.800 (0.128----4.987)	0.575
Enteric Fever, *n* (%)	6 (7.7)	5 (11.9)	0.617 (0.176----2.155	0.446
Enterocutaneous Fistula, *n* (%)	4 (5.1)	3 (7.1)	0.703 (0.150----3.299)	0.469
Gastrointestinal Malignancies, n (%)	17 (21.8)	14 (33.3)	0.557 (0.241----1.287)	0.168
Hollow Viscus Perforation, *n* (%)	12 (15.4)	6 (14.3)	1.091 (0.378----3.151)	0.872
Mesenteric Ischemia, *n* (%)	2 (2.6)	1 (2.4)	1.079 (0.095----12.259)	0.720
Necrotizing Pancreatitis, *n* (%)	1 (1.3)	3 (7.1)	0.169 (0.017----1.677)	0.123
Strangulated Hernia, *n* (%)	4 (5.1)	4 (9.5)	0.514 (0.122----2.167)	0.288
Tuberculosis Abdomen, *n* (%)	5 (6.4)	5 (11.9)	0.507 (0.138----1.862)	0.299

Table III: Comparison of Indications with Mode of Surgery (n=120)				
Indications	**Mode of Surgery**			**P-Value**
	Elective	**Emergency**	**O.R 95% C. I**	
Abdominal Sepsis, *n* (%)	3 (10.7)	3 (3.3)	3.560 (0.676----18.736)	0.139
Abdominal Trauma, *n* (%)	8 (26.6)	21 (22.8)	1.352 (0.521----3.509)	0.534
Anastomotic Leak, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Congenital Anomalies, *n* (%)	2 (7.1)	3 (3.3)	2.282 (0.362----14.395)	0.331
Enteric Fever, *n* (%)	2 (7.1)	9 (9.8)	0.709 (0.144----3.493)	0.503
Enterocutaneous Fistula, *n* (%)	3 (10.7)	4 (4.3)	2.640 (0.554----12.582)	0.205
Gastrointestinal Malignancies, *n* (%)	8 (28.6)	23 (25.0)	1.200 (0.466----3.091)	0.705
Hollow Viscus Perforation, *n* (%)	2 (7.1)	16 (17.4)	0.365 (0.079----1.697)	0.151
Mesenteric Ischemia, *n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Necrotizing Pancreatitis, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Strangulated Hernia, *n* (%)	4 (14.3)	4 (4.3)	3.667 (0.854----15.750)	0.085
Tuberculosis Abdomen, *n* (%)	3 (10.7)	7 (7.6)	1.457 (0.351----6.053)	0.425

Table IV: Comparison of Complications with Age Group (n=120)				
Complications	Age Group			P-Value
	20--40	>40	O.R 95% C. I	
Burst Abdomen, n (%)	1 (1.3)	1 (2.4)	0.532 (0.032----8.735)	0.579
Enterocutaneous Fistula, n (%)	1 (1.3)	2 (4.8)	0.260 (0.023----2.952)	0.280
Intestinal Obstruction, n (%)	4 (5.1)	7 (16.7)	0.270 (0.074----0.984)	0.042
Wound Infection, n (%)	4 (5.1)	5 (11.9)	0.400 (0.101----1.578)	0.163
Mucosal Prolapse, n (%)	6 (7.7)	2 (4.8)	1.667 (0.321----8.646)	0.423
Parastomal Hernia, n (%)	1 (1.3)	4 (9.5)	0.123 (0.013----1.142)	0.050
Skin Excoriation, n (%)	40 (51.3)	21 (50.0)	1.053 (0.497----2.229)	0.893
Stomal Diarrhea, n (%)	1 (1.3)	2 (4.8)	0.260 (0.023----2.952)	0.280
Stomal Necrosis, n (%)	4 (5.1)	2 (4.8)	1.081 (0.190----6.162)	0.649
Stomal Prolapse, n (%)	4 (5.1)	3 (7.1)	0.703 (0.150----3.299)	0.469
Stomal Retraction, n (%)	8 (10.3)	6 (14.3)	0.686 (0.221----2.128)	0.512
Stomal Stenosis, n (%)	2 (2.6)	2 (4.8)	0.526 (0.071----3.877)	0.437
Stomal Bleeding, n (%)	2 (2.6)	3 (7.1)	0.342 (0.055----2.133)	0.231

Table V: Comparison of Complications with Mode of Surgery (n=120)				
Complications	Mode of Surgery			P-Value
	Elective	Emergency	O.R 95% C. I	
Burst Rbdomen, *n* (%)	1 (3.6)	1 (1.1)	3.370 (0.204----55.696)	0.414
Enterocutaneous Fistula,*n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Intestinal Obstruction, *n* (%)	2 (7.1)	9 (9.8)	0.709 (0.144----3.493)	0.503
Wound Infection, *n* (%)	4 (14.3)	5 (5.4)	2.900 (0.722----11.646)	0.128
Mucosal Prolapse, *n* (%)	4 (14.3)	4 (4.3)	3.667 (0.854----15.750)	0.085
Parastomal Hernia, *n* (%)	2 (7.1)	3 (3.3)	2.282 (0.362----14.395)	0.331
Skin Excoriation, *n* (%)	13 (46.4)	48 (52.2)	0.794 (0.340----1.855)	0.594
Stomal Diarrhea, *n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Stomal Necrosis, *n* (%)	2 (7.1)	4 (4.3)	1.692 (0.293----9.766)	0.428
Stomal Prolapse, *n* (%)	3 (10.7)	4 (4.3)	2.640 (0.554----12.582)	0.205
Stomal Retraction, *n* (%)	4 (14.3)	10 (10.9)	1.367 (0.393----4.749)	0.420
Stomal Stenosis, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Stomal Bleeding, n (%)	3 (10.7)	2 (2.2)	5.400 (0.855----34.112)	0.082

DISCUSSION

Intestinal stoma formation is crucial surgical intervention that provides relief and improves the quality of life for patients with a variety of gastrointestinal conditions. The procedure creates an artificial opening in the abdominal wall for the diversion of fecal material which may be temporary, or permanent depending on underlying condition[16]. The indications for stoma formation can be distributed into emergency and elective cases, each with its own set of clinical scenarios[17]. In emergency situations stomas are typically applied for bowel obstruction, intestinal perforation, or trauma where immediate diversion is required to prevent life-threatening complications such as peritonitis, sepsis, or organ failure[18,19]. Elective indications, however, are more associated with chronic conditions, such as colorectal cancer, inflammatory bowel disease, diverticulitis or congenital anomalies where stomas help to relieve symptoms, bypass diseased bowel segments, or safeguard healing tissues after major surgeries[20].

Apart from knowing the indications for formation of the intestinal stoma, the complications brought about by the procedure have to be assessed. The complications could result in more surgeries, longer hospital reasons or a lower quality of life for the patient all of which can have a negative impact on the patient's condition. Common early complications of stoma include stoma necrosis, retraction, peristomal skin irritation and bleeding. Intra-operative variables, inadequate perfusion, or patient-related factors, such as obesity or malnutrition can all contribute to these complications[21]. Late complications which typically develop weeks to months after the procedure include parastomal hernia, stoma prolapse, stenosis and fistula formation[22]. These long-term issues may require additional surgical interventions and often have a significant psychological impact on patients, particularly as they adapt to life with a stoma.

The formation of an intestinal stoma is a significant surgical procedure often employed to manage a wide range of gastrointestinal disorders. This study examines the various indications for stoma creation, as well as the complications that can arise, with a particular focus on the unique challenges faced in resource-limited healthcare settings.

In this research, gastrointestinal malignancies (55.1%) and abdominal trauma (50.4%) emerged as the most common reasons for stoma formation. These findings align with prior work by Pandiaraja et al., which reported malignancies and trauma as major indications at rates of 25% and 22%, respectively[13]. However, our study also highlighted the prevalence of abdominal tuberculosis (18.3%) and necrotizing pancreatitis (8.4%), which were observed at higher rates compared to another study reporting 6% and 3%, respectively[13]. Such differences likely reflect regional variations in disease prevalence and healthcare availability.

The data also revealed distinctions in outcomes across different patient groups and surgical circumstances. Emergency surgeries, which accounted for 76.7% of the procedures, were associated with a higher occurrence of complications. For instance, intestinal obstruction was significantly more common among patients over 40 years of age (16.7% versus 5.1%, $p = 0.042$). Similarly, older patients experienced a higher frequency of parastomal hernias (9.5% vs. 1.3%, $p = 0.050$), suggesting that age is an important risk factor. Although certain complications, such as mucosal prolapse (7.7% in younger patients vs. 4.8% in older patients, $p = 0.423$) and stomal bleeding (2.6% in younger patients vs. 7.1% in older patients, $p = 0.231$), were not statistically significant, they remain clinically relevant. Mucosal prolapse, for instance, can lead to functional difficulties, while stomal bleeding may point to technical errors during surgery or vascular complications.

Discrepancies between this study and others highlight variations in healthcare infrastructure, surgical proficiency, and patient demographics. For example, while Dincer et al. identified rectal cancer as the most frequent indication for stoma creation (44.7%), this study observed a broader spectrum of gastrointestinal malignancies[7]. Additionally, complications such as skin excoriation were notably high in this study (51.3% in younger patients vs. 50.0% in older patients, $p = 0.893$), closely aligning with findings from Pandiaraja et al., who reported a prevalence of 52.4%[13]. This underscores the widespread need for enhanced stoma care practices worldwide.

Our study also noted higher rates of certain complications compared to other research. For instance, intestinal obstruction was reported in 21.8% of cases and wound infections in 17%, whereas a previous cohort documented rates of 7.3% and 8.5%, respectively[13]. These discrepancies may stem from differences in perioperative care, patient education, and the availability of specialized healthcare professionals. Addressing these challenges will require targeted approaches based on the unique characteristics of distinct health system contexts.

The study also recognizes avenues where further research is needed. These findings deserve validation in multi-center prospective studies and could be tested for their applicability to more heterogeneous populations. Long-term follow-up is required to identify long-term complications such as parastomal hernias and the effect of stoma on quality of life. New approaches, such as prophylactic mesh at the time of surgery, may reduce the subsequent hernia rate.

There is also the potential for the development of remote follow up systems for stoma care that may help to overcome barriers that patients living in more remote or underprivileged areas may face. Further research into the efficacy of these systems, especially within resource-poor environments, would also be beneficial in assessing their potential contribution to improving stoma management on a global scale.

The results of this study highlight the need to minimize complications through adequate preoperative and postoperative care. As an example, stoma sites prior to surgery are marked, and the rates of skin irritation and parastomal hernias are drastically reduced[5]. The implementation of such practices as part of routinely executed protocols can minimize the adverse events during and after the surgery.

Patient education is also an important component of stoma management. In addition, increased confidence in managing stoma appliances and ability to prevent skin excoriation will empower us in improving the quality of life among stoma patients. However, more specialized stoma care is needed because stoma patients often have other problems, and management in multidisciplinary teams involving wound care specialists, dietitians and mental health professionals is critical to providing stoma care and this approach to care provides the foundation for ongoing recovery for better patient outcomes.

CONCLUSION

The research highlights gastrointestinal cancers and abdominal injuries as the primary reasons for intestinal stoma formation, with most cases stemming from emergency surgeries. Complications like intestinal blockage, skin irritation, and stoma retraction were more prevalent, particularly in older individuals. These findings underscore the importance of careful planning before surgery and attentive care afterward to reduce risks.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contribution: The authors contributed to the study and manuscript as follows: **Dileep K:** Supervised the study, contributed to its design, and performed the final manuscript review. **Mazhar I, M. Naeem & Nighat G:** Provided administrative oversight, ensured compliance with ethical standards, and contributed to critical manuscript revisions. **Amber A. & Adeel AD:** Were responsible for data collection, patient management, and manuscript drafting**. Sunil DS & Shabina J:** Performed data interpretation, analysis, and manuscript editing. **Namra B & Fareha F:** Assisted with patient follow-up, data entry, and preparation of the initial draft.

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How to cite: Amber A, Dileep K, Adeel AD, Mazhar I, Sunil Dut S, Muhammad N, Namra B, Shabina J, Fareha F, Nighat G. Indications and Complications of Intestinal Stoma Formation. Pak J Med Dent Sci. 2024;1(2):56-62

MS No: PJMDS/CR/014/2024

Case Report

Cocoon Abdomen - A Rare Presentation of Abdominal Tuberculosis

Ameet Kumar[1], Natasha Khalid[2], Muhmmad Saqib Qamar Ishaqi[3], Aneeta[4], Pooja[5]

ABSTRACT

Background: Abdominal cocoon (sclerosing encapsulating peritonitis) is a rare disorder, characterized by fibrous encapsulation of the loops of small bowel. Although generally idiopathic, secondary causes can include tuberculosis, especially in endemic areas.

Case Presentation: We report a rare case of an isolated tuberculous abscess in the liver of a 26-year-old man with a 9-month history of high-grade fever, loss of weight, and generalised weakness, pyrexia of unknown origin and diffuse epigastric pain with radiation to the whole abdomen. On examination, he was pale and had temporal wasting, and signs of ascites with shifting dullness. Though Gene Xpert and AFB smear were negative, the analysis of ascitic fluid was exudative with highly raised adenosine deaminase (ADA) levels. CT-scan imaging showed encapsulated small bowel loops surrounded by chronically thickened peritoneum and moderate ascites consistent with abdominal cocoon due to tuberculosis. First-line anti-tuberculous therapy (ATT) was begun. The patient shows clinical improvement with substantial weight gain and disappearance of the symptoms after nine months of therapy. Follow-up CT-scan showed resolution of encapsulation and ascites.

Conclusion: Abdominal cocoon is an extremely rare form of tubercular presentation that has to be treated urgently by diagnosis and then can be effectively treated conservatively with ATT if diagnosed early. This case emphasises the need for integration of clinical, biochemical, and radiological findings for prompt, non-operative management in endemic regions.

Keywords: Abdominal cocoon, Ascitic fluid, Anti-tuberculous therapy (ATT), Sclerosing encapsulating peritonitis, Tuberculosis

INTRODUCTION

The abdomen of the cocoon, also known as the abdominal cocoon syndrome or peritonitis of idiopathic sclerosation, is a rare affection which can complicate abdominal tuberculosis. In this syndrome, there is a formation of fibrous tissue that Encapsulates up the intestines, leading to intestinal obstruction. This phenomenon is not only rare but has significant diagnostic challenges, especially in patients with abdominal tuberculosis.

Clinical significance occurs due to the severity of the symptoms associated with the abdomen of the cocoon. Patients generally have signs of intestinal obstruction, including abdominal pain, vomiting and constipation. In cases where tuberculosis is involved, these symptoms can be confused with other complications of the disease. A Rastogi study highlights the importance of recognizing the abdomen of the cocoon as a possible complication of abdominal tuberculosis, as it can considerably affect patient results if it is not identified early[1].

Diagnosis remains a challenge. The abdominal cocoon often imitates other conditions and can be misunderstood as a primary obstruction of the intestine. It has been suggested that advanced imaging techniques such as MRI and computed tomography helping these diagnosis; These can reveal the unique characteristics of the Coon abdomen. Various authors emphasize the usefulness of these imaging methods. Chaudhary et al. discuss the distinct imaging characteristics of abdominal tuberculosis and how they can present Cocoon syndrome[2]. In addition, Nadamani et al. present the series of imaging cases which highlight the need for complete diagnostic approaches[3].

Corresponding Author
Ameet Kumar
Email: drameetbm@hotmail.com

Affiliations:
Resident, Indus Hospital and Health Network, Karachi[1,2]
Consultant Radiologist and Head of Department, Indus Hospital and Health Network, Karachi[3]
Consultant, National Institute of Child Health, Karachi[4]
Resident, Liaquat University Hospital, Hyderabad[5]

Submitted: July 18, 2024
Revised: November 26, 2024
Accepted: December 10, 2024

Treatment strategies for the cocoon abdomen depend on the severity of the patient's obstruction and overall state. Surgical intervention may be necessary in serious cases where intestinal obstruction causes ischemia. In cases involving abdominal tuberculosis, a combination of anti-tuberculosis therapy and surgical management has proven beneficial. Girdhar et al. describe a case of tuberculous abdominal cocoon which has been managed effectively surgically as well as the appropriate treatment of tuberculosis[4]. This highlights the importance of an interdisciplinary approach in the management of these cases.

The scarcity of the cocoon abdomen linked to its association with abdominal tuberculosis underlines the need for increased awareness of health care providers. Cases like those documented by Chorti et al. underline the importance of studying unusual presentations and to consider the abdomen of the cocoon in differential diagnoses[5]. In addition, each case contributes to an increasing set of literature which informs better management strategies, as demonstrated in the case of magazines of Mandavdhare et al.[6].

The clinical meaning of the abdomen of the cocoon in abdominal tuberculosis is underlined by its unusual challenges of presentation and diagnosis. Adequate recognition and management strategies are essential to improve patient results, requiring in-depth understanding and current research in this rare clinical scenario. The implications for patient management are deep, especially since the medical community meets more cases in various populations[7-14].

This case report highlights a rare presentation of abdominal cocoon secondary to tuberculosis in a young male patient managed at a tertiary care hospital in Karachi, Pakistan. The report underscores the importance of early diagnosis using clinical, biochemical, and radiological findings, along with successful conservative management using ATT.

CASE DESCRIPTION

A 26-year-old male presented in Indus Hospital Karachi, with complaints of high-grade fever with night rise, body aches and generalized weakness for 9 months. He had significant weight loss with severe pain in epigastrium radiating to whole

abdomen, associated with movement, especially lying straight or turning in bed and deep breathing. He did not have any other relevant systemic complaints, medication history, addictions or family history of any chronic or current illness.

He was vitally stable on examination. Systemic examination was consistent with pallor and temporal wasting. He had a distended abdomen that was tender with no visceromegaly but shifting dullness was present and gut sounds were also audible. Other systems were grossly unremarkable. He was admitted and initial lab work up showed Hemoglobin of 13g/dl with a raised ESR. His renal and liver profile was normal. Ascitic fluid analysis was consistent with an exudate with high protein and low SAAG ratio. Ascitic fluid Adenosine deaminase levels were significantly raised, Gene Xpert for MTB and AFB smear was negative for Mycobacterium Tuberculosis. HIV serology was also negative. CT scan abdomen showed evidence of encapsulated cocoon like small bowel loops with surrounding peritoneal thickening / enhancement. Moderate ascites was seen within the sac. However, there was no evidence of intestinal obstruction. Findings were likely suggestive of cocoon abdomen seen in abdominal tuberculosis. (Figures 1 and 2)

On the basis of clinical history and radiological findings, awaiting TB culture, he was started on treatment for abdominal tuberculosis with first line Anti-Tuberculous drugs including Isoniazid, Rifampicin, Pyrazinamide and Ethambutol according to his weight. He was discharged home with close follow ups in clinic. On follow up he remained well with no adverse effects to the therapy. After completing treatment for 9 months for abdominal tuberculosis, his clinical findings had markedly improved and he had gained weight of 8 kgs. Repeat imaging was done at the end of treatment that showed complete resolution of previously noted encapsulated small bowel loops with peritoneal thickening and ascites.

Figure 1: An axial image of CT Abdomen with Contrast of our patient showing bowel loops in a cocoon form

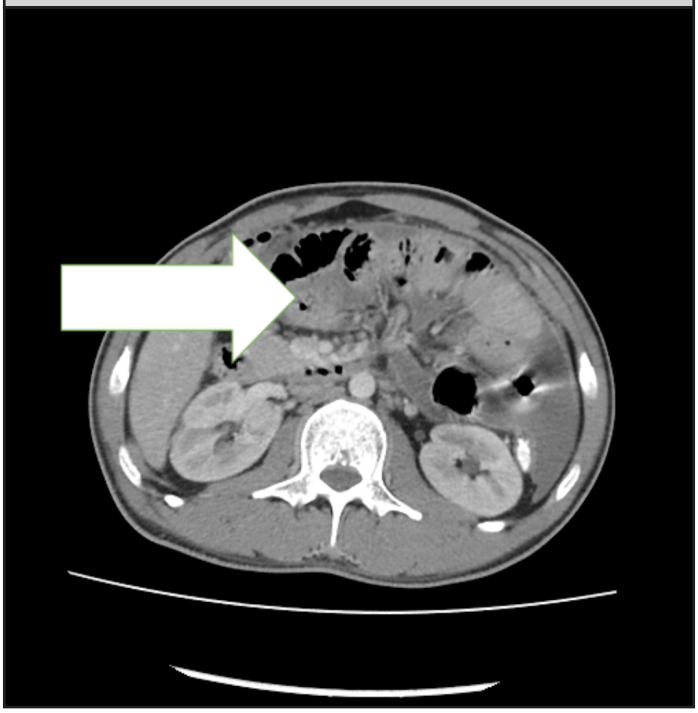
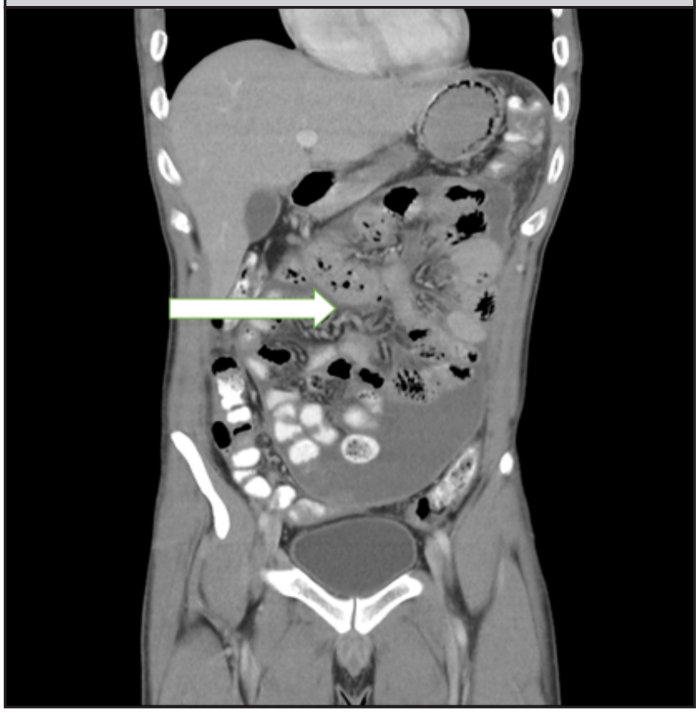


Figure 2: A coronal section of CT scan Abdomen showing cocooning of the intestinal loops.



DISCUSSION

Sclerosing encapsulating peritonitis, also known as abdominal cocoon syndrome is a rare and still mysterious phenomenon that causes intestinal obstruction and is characterized by a thick, fibrous sheet of tissue surrounding almost all the loops of the small bowel. Though most cases are idiopathic, it may also be due to tuberculosis, peritoneal dialysis, some drugs, and recent abdominal surgery. This is a more common condition in young women and in tropical and subtropical regions due to the higher burden of diseases such as tuberculosis and other risk factors[1,2].

Abdominal cocoon syndrome usually has non-specific symptomatic presentation, which includes intermittent colicky abdominal pain, progressive weight loss, nausea, vomiting, and partial or complete intestinal obstruction of varying degree. Abdominal distention and tenderness are frequently noted on physical examination; however, abdominal mass is inconsistently identified and contributes to difficulty in diagnosis[3].

The preferred diagnostic investigation is contrast enhanced computed tomography (CT) with classic findings including “concertina” or “bottle guard” pattern of the involved jejunal loops gives a characteristic CT findings, including small bowel loops that tend to be encapsulated in a “concertina” or “bottle guard” patter 12. Yet, all of these hallmark signs are not necessarily present, rendering the diagnosis somewhat elusive in certain cases. Due to the rarity and non-specific nature of the presentation, abdominal cocoon syndrome was traditionally diagnosed intra-operatively. Because of imaging advances, particularly the advent of CT, the diagnosis of the condition has greatly improved, allowing for a reduction in exploratory surgery[4-6].

Background in areas endemic for tuberculosis, a tubercular cause should be strongly suspected, especially if the ascitic fluid has a high adenosine deaminase (ADA) level. The optimal management of this rare entity associated with tuberculosis remains controversial but ATT forms the backbone of treatment and is very effective in resolving the clinical presentation and

imaging findings. Complicated cases of patients who present with bowel obstruction, perforation, and refractory medical management are indicated for surgery[7-9].

Although histopathological examination yields important information, as it has been consistently reported to show a fibro-collagenous membrane that is several millimeters thick with chronic inflammatory change in the surrounding tissue (e.g., lymphocytic infiltration and reactive hyperplasia of mesenteric lymph nodes in the case of tuberculosis). This information aids in the diagnosis and subsequent management[10-12].

Diagnosis of abdominal cocoon syndrome is important to avoid unnecessary surgical procedures through accurate diagnosis especially early. We highlight the role of advanced imaging modalities, cytological and chemical analysis of ascitic fluid, and histopathological findings in helping to distinguish this rare entity from more common causes of intestinal obstruction. In this context, early initiation of ATT in TB-related cases is often associated with significant clinical improvement, underscoring the principle that conservative management is appropriate in the majority of cases, with surgery appropriate in the face of complications[13,14].

CONCLUSION

Abdominal cocoon is an extremely rare form of tubercular presentation that has to be treated urgently by diagnosis and then can be effectively treated conservatively with ATT if diagnosed early. This case emphasizes the need for integration of clinical, biochemical, and radiological findings for prompt, non-operative management in endemic regions.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contributions: All authors took part in this study to an equal extent. **Ameet K** Managed data collection and patient care. **Natasha K** Contributed to clinical evaluation and manuscript editing. **M Saqib QI** Provided radiological evaluation and discussion input. **Aneeta** reviewed clinical findings and revised the manuscript. **Pooja** assisted with data organization and final proofreading**.**

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How to cite: Ameet K, Natasha K, Muhmmad SQI, Aneeta, Pooja. Case Report: Cocoon Abdomen- A rare presentation of Abdominal Tuberculosis. Pak J Med Dent Sci. 2024;1(2):63-65

MS No: PJMDS/CR/033/2024

Case Report

Acquired Von Willebrand Disease Due to Subclinical Hypothyroidism: A Case Report

Nazish Saqlain[1], Huda Tariq[2], Naseeb Mumtaz[3], Ali Kamran[4]

ABSTRACT

Background: Acquired von Willebrand Disease (VWD) is a rare bleeding disorder characterized by severe bleeding tendencies without prior personal or family history. It is often secondary to conditions such as lymphoproliferative or cardiovascular disorders and hypothyroidism, which reduce von Willebrand Factor (VWF) levels or function. Although acquired VWD has been associated with clinical hypothyroidism, reports of cases showing atypical features like neurological deficits due to subclinical hypothyroidism are rare.

Case Presentation: A case of a 34-year-old man with bilateral lower limb weakness occurring suddenly after a history of mild trauma was reported at Lahore General Hospital. On clinical examination decreased muscular tone and strength with hyporeflexia was noted and image study revealed spinal extradural hematoma. Clotting investigations demonstrated a prolonged activated partial thromboplastin time (APTT) at presentation, and this was corrected on mixing. Further investigations showed low von Willebrand Factor (VWF) level (3.5%) confirming acquired VWD. Thyroid function tests showed subclinical hypothyroidism (elevated TSH level↑ with normal T3 and T4 levels). The patient was treated with Humate-P and Tranexamic Acid replacement therapy and later with thyroid hormone replacement. Euthyrestoration led to the normalization of coagulability parameters and clinical improvement.

Conclusion: This case demonstrates an unusual and previously undocumented association of subclinical hypothyroidism and acquired VWD, presenting atypically with spinal hematoma and neurologic symptoms. This underscores the importance of a thorough diagnostic workup for the treatment of bleeding disorders which could even be seen with few underlying endocrine disorders.

Keywords: Acquired von willebrand disease, Bleeding disorder, Hematoma, Spinal extradural, Subclinical hypothyroidism, von willebrand factor

INTRODUCTION

Acquired von Willebrand disease (AVWD) is a rare but important bleeding disorder seen in people with no previous personal or family history of bleeding disorders. This manifests as a higher tendency to bleed that may become serious. Before we look at the AVWD types and therapeutic approaches, it is necessary to mention that the cause of AVWD is often due to decreased levels or activity of VWF, a multimeric glycoprotein essential for hemostasis[1].

Later in life involves not a congenital defect goes on after the fact in view of different diseases. Various disorders have been associated with it, especially lymphoproliferative disorders (non-Hodgkin's lymphoma), myeloproliferative disorders (essential thrombocythemia), and some cardiovascular diseases (aortic stenosis)[2]. The extraction, inhibition (or both) or destruction of VWF is frequently the pathophysiology and is responsible for interfered and therefore normal clotting mechanisms.

In addition, a significant association exists between clinical hypothyroidism and AVWD. In most cases of AVWD, VWF levels are markedly abated, which is a major contributor to the bleeding diathesis present in hypothyroid patients with AVWD[3]. The decrease in levels of VWF is thought to be due to the decreased overall protein synthesis characteristic of hypothyroidism or via altered factor clearance.

Furthermore, both research and clinical experience show that normalisation of coagulation parameters in hypothyroid patients with AVWD can be achieved when a euthyroid state (normalisation of thyroid hormone levels) is accomplished. This enhancement highlights the necessity for handling thyroid dysfunction in AVWD individuals to minimize the risk of bleeding and bring balance to hemostasis.

Corresponding Author
Nazish Saqlain
Email: nazish68@yahoo.com

Affiliations:
Lahore General Hospital/AMC/PGMI, Lahore
Professor of Pathology[1]
Postgraduate Resident[2,3]
Mayo Hospital, Lahore
Medical Officer[4]

Submitted: October 01, 2024
Revised: November 13, 2024
Accepted: November 14, 2024

CASE REPORT

A 34-year man with no history of diabetes, hypertension or bleeding diathesis presented to the Lahore General Hospital with sudden weakness of both lower limbs, unable to bear weight on both legs. He gave history of fall from stairs 2 months ago and slight bruising on his back was noticed. There were no associated neurological symptoms and personal or family history of bleeding tendency. On clinical examination, tone and power were reduced in both lower limbs with hyporeflexia while systematic examination was unremarkable.

His coagulation profile showed PT 11 seconds (control 11 seconds) and APTT 42 seconds (control 26 seconds). After mixing studies, APTT was corrected from 42 seconds to 31 seconds. Samples were taken and sent for Factor VIII, IX, XI and von Willebrand Factor. MRI lumbosacral spine was performed which revealed presence of extramedullary extradural hematoma measuring 5.7cm in long axis, opposite to L1 till L3 vertebral levels. Laminectomy was performed by Neurosurgery Department under cover of FFPs to avoid irreversible nerve damage.

Postoperatively, oozing of blood started from surgical site on 3rd postoperative day. Clotting factor studies were as follows: Factor VIII 45.2% (N: 50%-150%), Factor IX 80% (N: 50%-150%), Factor XI 75% (N: 65%-130%), Von Willebrand Factor 3.5% (N: 50%-200%).

Based on clinical presentation and investigations, diagnosis of Acquired VWD was made. Patient was managed with Humate-P (Loading dose 2000IU B.D followed by maintenance dose of 1500IU B.D for 5 days) and Tranexamic Acid. Oozing of blood stopped 2 days after initiation of Humate-P.

Further workup for cause of AWD revealed normal echocardiography, autoimmune profile and serum protein electrophoresis, though thyroid function tests revealed hypothyroidism (T3: 0.5ng/mL, T4: 1.33ug/dL and TSH: 10.08 IU/mL). He was diagnosed as a case of Acquired VWD secondary to hypothyroidism.

He was prescribed levothyroxine 75ug/day and after 8 weeks coagulation parameters including von Willebrand Factor levels returned to normal after patient became euthyroid.

DISCUSSION

Acquired VWD is a rare disorder, with reported incidence of 0.04% and approximately 8% cases of acquired VWD are attributed to hypothyroidism[3]. The laboratory findings of acquired VWD are similar to inherited VWD and it is distinguished from inherited VWD on basis of lack of previous bleeding history or family history, disease onset at older age and association with different conditions. Clinical hypothyroidism is associated with reduced formation of VWF and its reduced release in circulation, resulting in manifestations of acquired VWD[3].

Ghariani et al, presented case reports of five patients diagnosed with acquired VWD. Lymphoproliferative, autoimmune and cardiovascular diseases were the most prevalent conditions identified in these patients. Four patients were treated for underlying conditions and improvement in von Willebrand Factor levels was observed in all cases[4].

Cakir et al, presented case report of a patient, who developed profuse bleeding after dental extraction, due to bleeding diathesis caused by reduced levels of VWF as a result of profound untreated hypothyroidism. Normalization of coagulation parameters was achieved only after patient became euthyroid[5].

Baioumi et al, also presented a case of girl, who presented with complaints of profuse bleeding after dental extraction and menorrhagia. Thyroid function tests revealed hypothyroidism and there was deficiency in von Willebrand Factor levels. She was diagnosed as a case of Acquired VWD and managed with levothyroixine therapy which led to normalization of coagulation parameters[6].

Similarly, Alabbood et al, also presented the case of a patient who developed severe intraoperative bleeding during elective rhinoplasty. She had history of thyroidectomy 2 years and discontinued thyroxine replacement 18 months ago. Her thyroid function tests revealed hypothyroidism and diagnosis of acquired VWD was made after further workup. She was put on thyroid replacement therapy which led to normalization of coagulation parameters after 6 weeks[7].

Although, cases have been reported in literature regarding association of hypothyroidism with acquired VWD, to the best of our knowledge, this is the first presentation of hypothyroidism associated-acquired VWD presenting with neurological symptoms and extradural hematoma. This case report will add to the current knowledge of atypical presentations of acquired VWD and will offer insights in diagnosis and management of these patients.

CONCLUSION

This case demonstrates an unusual and previously undocumented association of subclinical hypothyroidism and acquired VWD, presenting atypically with spinal hematoma and neurologic symptoms. It emphasizes the need for extensive diagnostic workups to be performed in patients experiencing atypical bleeding presentations and also where there is no past history of bleeding. As in the case of thyroid hormone replacement therapy, treatment of the underlying endocrine disorder is essential to restore von Willebrand Factor levels to normal and relieve symptoms. Such unusual and complex presentations are repetitive reminders of the need for coordinated interdisciplinary care to enhance the desired outcomes in these situations.

Conflict of Interest: Authors declare that there is no conflict of interest.

Source of Funding: Nil

Authors' Contributions: All authors contributed significantly to this case report. **Nazish S:** Supervised the study and critically revised the manuscript—**Huda T:** Conducted data collection, literature review, and initial drafting. **Naseeb M:** Contributed to clinical evaluation and manuscript preparation. **Ali K:** Provided clinical insights and assisted in refining the manuscript. All authors approved of the final version.

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How to cite: Nazish S, Huda T, Naseeb M, Ali K. Acquired Von Willebrand Disease Due to Subclinical Hypothyroidism: A Case Report. Pak J Med Dent Sci. 2024;1(2):66-67

MS No: PJMDS/LTE/032/2024

Letter to the Editor

Cardiovascular Breakthroughs: Exploring New Treatments and the Gut-Heart Axis

Eisha Abid[1], Abid Ali[2]

Dear Editor,

Cardiovascular disease (CVD), the top global killer, encompasses all heart and blood vessel diseases (hypertension, CHD, cerebrovascular disease). CVD accounted for nearly 30% of global deaths and was responsible for more than 17.5 million deaths in 2012 according to the World Health Organization[1]. Advances in genomics, tissues engineering and gut microbiome research have uncovered novel paths that may represent the panacea to this public health challenge.

In a new perspective published in the peer-reviewed journal Pharmaceutical Research from Springer, researchers from the University of Houston's College of Pharmacy highlight the importance of expression of Itgb1 in cardiomyocytes, which is a gene essential for heart development. Its development is necessary for the appearance of trabeculae, muscle bundles that help oxygen and nutrient exchange in the embryonic heart. Disruption of trabecular integrity by simultaneous loss of Itgb1 impairs sarcomere organization and induces LVNC cardiomyopathy. Such findings highlight the importance of Itgb1 and its binding partner β1 integrin in regulating cardiomyocyte function and provide a strong basis for further therapeutic development[2].

In a new report Public Library of Science, scientists at the Stanley Manne Children's Research Institute in Chicago describe removal of the gene UQCRFS1 in adult mice that permit damaged heart muscle cells to be rejuvenated as well as replace. Such process actually revert cardiomyocytes into a state which was seen in fetal heart and thus aid in cardiac tissue generation. This approach could be used for congenital heart defects in newborns and for regenerating damaged hearts in adults applying it post-heart attack. This genetic impact, provided we can determine a way to induce (or possibly inhibit) it with medication, represents a non-invasive therapeutic pathway[3].

The gut microbiome also recently entered the whole world of cardiovascular health. Gut dysbiosis has been reported as accelerating CVD progression[4]. Specific bacteria may also ferment cholesterol (within the intestines) e.g., species in the genera Oscillibacter, Eubacteria that metabolize cholesterol for excretion which could lead to decreased cholesterol levels in blood plasma[5]. On the other hand, different bacteria like Parabacteroides merdae, show an association with having a higher C-reactive protein (CRP) concentration, indicating higher inflammation that correlates with higher risk of CVD. Furthermore, the metagenomic species msp-120 from the Firmicutes phylum also associated with cholesterol metabolism, with elevated plasma cholesterol levels relating strongly with increased levels of msp-120. Such associations between systemic inflammation and gut microbiota suggest that targeting gut microbiota may be candidate microbiome-targeted therapies that may help mitigate CVD[5].

In Pakistan, while CVD is an increasing health burden, the situation is even more challenging owing to the lack of public awareness regarding such scientific advancements. We need to channel our efforts and work towards raising awareness about heart health, encouraging preventive action and ensuring that there is early diagnosis and therapeutic intervention! Public health campaigns, collaboration between researchers and policy-makers, dissemination of best research findings can create a road to a healthier nation, reducing the burden and impact of cardiovascular diseases.

Authors' Contribution: Eisha A, & Abid A: worked on the concept, design, critical review and final version of the Letter.

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How to cite: Eisha A, Abid A. "Cardiovascular Breakthroughs: Exploring New Treatments and the Gut-Heart Axis". Pak J Med Dent Sci. 2024;1(2):68

Corresponding Author
Eisha Abid
Email: eishaabidsmc@gmail.com

Affiliations:
Jinnah Sindh Medical University
MBBS Student[1]
Assistant Professor of Biochemistry[2]

Submitted: September 30, 2024
Revised: December 02, 2024
Accepted: December 03, 2024

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Address: Gulistan-e-Jouhar, Block-7, Karachi. | **PostalCode:** 75290
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