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The Importance of Haematocrit in Prediction of Severe Acute Pancreatitis

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Abstract: ***Background:*** *Acute pancreatitis is fortunately usually a mild and self-limiting disease. About 20-25 % of patients may have severe form with mortality going to 5 - 30%. The microcirculation disorder is the main cause of the pancreatic necrosis. There's higher vassal permeability inside the pancreatic tissue, which leads to a higher blood viscosity and its stasis in the microcirculation. Early identification of the risk factors in the severe acute pancreatitis development has potential advantages of aggressive treatment at intensive care unit or transfer to higher centre, by preventing or minimizing the possible complications. Haematocrit has been used as a predictor of severity of acute pancreatitis.* ***Objectives:*** *To study the significance of haematocrit in prediction of severity of acute pancreatitis.* ***Methods:*** *Patients admitted with first episode of acute pancreatitis from February 2011 to December 2014 were included. Haematocrit at admission and 24 hours of admission were compared with severity of acute pancreatitis. Mean, analysis of variance, chi square, Pearson correlation were used for statistical analysis.* ***Results:*** *123 patients were included in the study with 76 (61.8%) female and 47 (38.2%) male. Haematocrit at 24 hours of admission was higher in severe acute pancreatitis (p value 0.003). Both haematocrit at admission and at 24 hours had positive correlation with severity of acute pancreatitis (r: 0.297; P value 0.029 and r: 0.543; P value 0.011) respectively. Conclusion: Haematocrit is a simple, cost effective and widely available test and can predict severity of acute pancreatitis.*

Keywords: Acute necrotizing pancreatitis, Haematocrit, hospital admission, severity prediction, cost effective

1. Introduction

Acute pancreatitis (AP) is an acute inflammatory disease of pancreas. Severe form of disease is characterized by persistent organ failure, pancreatic necrosis and other local and/or systemic complications with mortality up to 30%{1}–{4}. Early identification of these patients has advantages of early admission to intensive care unit thus preventing or minimizing the risk of further complications and death. There are several systems and scores to predict the severity of AP like Ranson's criteria, APACHE II, Computerized Tomography (CT) criteria, BISAP score etc{3},{5}–{7}. However most of these scoring systems are cumbersome, take around 24 to 48 hours to calculate or use diagnostic tests that are not widely available { 8}. Studies have shown that haematocrit at admission is a useful tool to evaluate the severity of AP however the role of haematocrit in determination of severity of acute pancreatitis is still controversial. We conducted a descriptive study with an aim to study the significance of haematocrit at admission and at 24 hours after, in predicting the severity of AP.

2. Methods

123 patients admitted in the Emergency Room of Department of Surgery, Hospital University Center "Mother Theresa" in Tirana (a tertiary level hospital),from February 2011 to December 2014 were included in the study. The diagnosis was acute pancreatitis Patients with systemic disease which has effect on haematocrit estimation, as haematological disease, chronic liver disease, chronic kidney disease were excluded, as well as patients referred from other centers. Diagnosis of AP was made if two of the following three conditions were present (1) abdominal pain consistent with AP; (2) serum amylase (or lipase) more than three times the normal value; (3) characteristic findings of AP on abdominal ultrasound, CT or MRI 1. Severity of pancreatitis was classified as per Revised Atlanta Classification as mild, moderately severe and severe acute pancreatitis{2}. Demographic data, history, relevant physical findings, serum amylase, liver function test including haematocrit at admission and at 24 hours of admission, abdominal ultrasound, CT abdomen and MRI abdomen (if done) findings were noted. Haematocrit at admission and 24 hours of admission were compared with severity of AP based on revised Atlanta classification.

3. Statistical Analysis

Categorical variables were expressed as absolute or relative, and continuous variables were expressed as mean ± SD. ANOVA test was used to analyze continuous variables between different groups while chi square test was used on categorical variables. Pearson correlation was used to test correlation between haematocrit and severity of pancreatitis. Classification of severity based on revised Atlanta classification was used as gold standard of severity. p value of < 0.05 was considered statistically significant. Statistical Package for the Social Science (SPSS) version 20.0 was used for analysis of data.

4. Results

123 patients with acute pancreatitis were included in the study. 26 patients were excluded from the study, four patients had associated liver disease, six patients had chronic

kidney disease and ten patients were referred from other centers. Mean age of the patients was 52.26 years (range 18 – 81 years) with 76 (61.8%) female and 47 (38.2%) male. Biliary pathology was the cause of AP in 92 (74.8%) patients, alcohol was the cause in 25 (20.3%) patients, one patient (0.8%) had acute pancreatitis after Endoscopic Retrograde Cholangiopancreatography (ERCP) and five (4 %) had idiopathic pancreatitis. There were 59 (48.4%) patients with mild AP, 48 (38.7%) patients with moderately severe AP and 16 (12.9%) patients with severe AP. Both haematocrit at admission and haematocrit at 24 hours had positive correlation with severity of AP with correlation coefficient 0.297; P value 0.029 and 0.543; P value 0.011 respectively.

Table 1: Mean age and sex distribution according to the severity of AP

Severity of Acute Pancreatitis based on revised Atlanta classification				*p value*
	Mild	Moderately severe	Severe	
Mean Age in years (± SD)	48.8 (±12.63)	49.26 (± 17.85)	46 (±17.91)	0.863 a
Sex				
Female	36(47.4%)	29 (38.1%)	11 (14.5%)	0.991 b
Male	23 (49%)	19 (40.4%)	5 (10.6%)	

a Calculated by ANOVA
b Calculated by Chi square test

Table 2: Haematocrit in different grades of severity p value calculated by ANOVA

Severity of Acute Pancreatitis based on revised Atlanta classification				*p value*
	Mild	Moderate severe	Severe	
Mean of haematocrit in % at admission	40.57 (± 6.29)	45.35 (± 7.74)	47.42 (± 2.28)	0.090
Mean of haematocrit in % at 24 hours of admission	36.72 (± 4.47)	41.12 (±5.55)	46.45 (± 3.16)	0.003

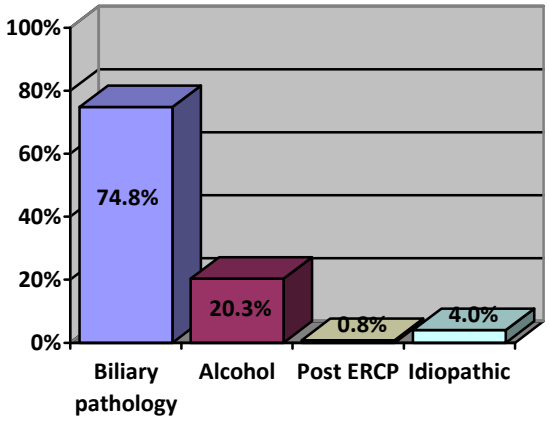

Figure 1: Etiology of Acute Pancreatitis

5. Discussion

Severe acute pancreatitis can occur in about 20-25% of patients with AP with mortality 5-30%{4}. Severe form of disease is characterized by persistent organ failure, pancreatic necrosis and other local and systemic Complications{1}. Identification of patients at risk of severe disease early in the course of disease allows early triage of the patients, early fluid resuscitation, admission to a high care or intensive care units and transfer of patients to specialized tertiary centers.

A case control study comparing haemoconcentration in patients with necrotizing pancreatitis with that in mild pancreatitis showed that the haematocrit at admission of ≥ 47% was seen in more patients with necrotizing pancreatitis than mild pancreatitis. At 24 hours of admission failure of admission haematocrit to decrease was also significant in necrotizing pancreatitis group{9}. Another prospective study showed that haematocrit at admission ≥ 44% and/or failure of haematocrit to decrease at 24 hours of admission was associated with development of necrotizing pancreatitis and organ failure with negative predictable value for necrotizing pancreatitis and organ failure of 96% and 97% respectively{10}. However, Troche et al16 studied association of hematocrit at admission or at 24 hours after admission with severe AP, organ failure, and pancreatic necrosis and found that hematocrit was not a good predictor of severity in AP. Their results showed that the sensitivity, specificity and positive predictive values for necrosis and organ failure were low but negative predictive values was between 61% to 86%, being highest for organ failure{12}. Current study showed that the level of haemoconcentration as evidenced by haematocrit level was higher as the grades of severity increases both at admission and 24 hours of admission but statistically significant difference was seen in the level of haematocrit at 24 hours of admission (P value 0.090 vs 0.003).

Both haematocrit at admission and at 24 hours had positive correlation with severity of AP with correlation coeffi cient of 0.387 (P value - .031) and 0.584 (P value .001) respectively which is statistically significant. A study observed high negative predictive value of haematocrit and suggested that in the absence of hemoconcentration, contrast-enhanced CT may be unnecessary on admission unless the patient does not improve{11}. The negative predictable value of haematocrit has been used in Harmless Acute Pancreatitis Score (HAPS) in which absence of haemoconcentration (Haematocrit< 43% for male and < 39.6% for female) along with absence of rebound tenderness and serum creatinine < 2 mg/dl has been found to be sensitive and specific to predict non severe acute pancreatitis{13},{14}. Haematocrit is a simple haemotological test. It is cost effective, less time consuming, reproducible and is even available in primary health care facilities. So it can be used even in primary health care centre to predict severe course in AP and initiate early treatment and early transfer to higher centre. Our study has certain limitations. It is a single centre study with small sample size and hence, the results may not be generalized. A multicentre study with larger sample size would be required.

6. Conclusion

Haematocrit is a simple, cost effective, reproducible and widely available test that can be used for early prediction of severity in acute pancreatitis presenting with the first episode and in acute pancreatitis without fluid resuscitation. It can be used even in primary health centre and emergency department of higher centre for early risk stratification and early transfer to intensive care units.

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