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PROCEEDINGS

SHAIKH ZAYED POSTGRADUATE MEDICAL INSTITUTE

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CONTENTS

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Frequency of LVF in First ST Elevation Myocardial Infarction (STEMI) and Comparison of Mean Left Atrial Volume in Patients With and Without Left Ventricular Failure (LVF) in First STEMI

Wasim Ahmed, Qazi Abdul Saboor, Adnan Salim Malik, Saulat Siddique, Amber Malik, Abu Bakar Hilal, Husnain Bashir and Muhammad Abdul Rehmaan

Department of Cardiology, Shaikh Zayed Postgraduate Medical Institute, Lahore

ABSTRACT

Introduction: The epidemic of heart failure (HF) is an important public health issue facing the health care system.[1] Acute myocardial infarction (AMI) is one of the major causes of HF.[2] Left ventricular failure (LVF) is a serious complication of AMI that can lead to sudden cardiac death.[3] Advanced Diastolic dysfunction is associated with poor prognosis of patients with AMI despite having preserved systolic function.[4] Increase Left atrial volume (LAV) which is a marker of diastolic dysfunction, is an independent predictor of death or HF hospitalization following high-risk MI.[5] **Objective:** To determine the frequency of LVF in First ST Elevation Myocardial Infarction (STEMI) and Comparison of mean LAV in Patients With and Without LVF in first STEMI. **Study Design**: Cross sectional survey. **Study Setting:** Department of Cardiology, Sheikh Zayed Hospital, Lahore. **Duration Of Study:** From 29th April 2013 to 29th October 2013. **Patients & Method:** 150 patients fulfilling the inclusion criteria were enrolled from coronary care unit of Shaikh Zayed Hospital, Lahore. All patients underwent a complete echocardiographic examination with a 3.5 MHz transducer, and were recorded on CDs. Left ventricular volume was measured by manually tracing the LV cavity using the biplane modified Simpson's algorithm when >80% of the endocardial border could be detected in both the apical four- and two-chamber views, and by a single plane when 80% of the endocardial border could be detected only in the apical four-chamber view. All patients were assessed for LVF by signs and symptoms and those who developed LVF were graded according to Killip class. Demographic data (age, name, sex, address were noted) and data was recorded on proforma attached. **Results:** Mean left atrial volume was almost same in the patients with and without left ventricular failure i.e. 35.24±1.14 and 35.16±1.19 ml. **Conclusion:** There is no significant difference in mean left atrial volume of patients who initially present with or without heart failure and a first STEMI. However this study was done on small group of patients. For better evaluation of relationship between left atrial volume and left ventricular failure in STEMI, a study with large number of patients is required.

Key words: First STEMI, LA volume, LVF.

INTRODUCTION

Cardiovascular disease is the leading cause of death in today's era. Approximately 500,000-700,000 deaths related to the coronary arteries occur in each year[1]. Acute Myocardial infarction (AMI) may lead to impairment of systolic and diastolic function and to increased predisposition to long-term complications. Left ventricular failure (LVF) occurs in about 17% of patients with acute myocardial infarction who are non diabetic and this figure is doubled in diabetics.[2]

LVF is a manifestation of acute alterations in left ventricular function. The incidence of LVF has been reported to increase with age, almost doubling after 60 years of age. Systolic dysfunction leads to LVF which is a recognized and major cause of death following AMI.[3]

Diastolic heart failure occurs when signs and symptoms of heart failure are present but left ventricular systolic function is preserved (i.e., ejection fraction greater than 50 percent). The incidence of diastolic heart failure increases with age; therefore, 50 percent of older patients with heart failure may have isolated diastolic dysfunction.

With early diagnosis and proper management the prognosis of diastolic dysfunction is more favorable than that of systolic dysfunction.[4] In AMI, diastolic dysfunction is an important parameter to define because advanced diastolic dysfunction leads to increase in hospital mortality.[3]

After an AMI, myocardial ischemia, cell necrosis, micro vascular dysfunction, and regional wall motion abnormalities will influence the rate of active relaxation. In addition, interstitial edema, fibrocellular infiltration, and scar formation will directly affect LV chamber stiffness. Thus, abnormalities in LV filling are common in this setting.

Mitral inflow velocity is the common method to determine the diastolic dysfunction. By mitral inflow velocities, grade III or IV diastolic dysfunction is associated with poor in hospital survival in patients with AMI.[5] But mitral inflow velocities are suddenly changed in acute insult of myocardium such as in AMI.

Hence, mitral inflow velocities at the time of the AMI do not accurately define the chronic LA remodeling against increased LV filling pressures as in diastolic heart failure because these variables reflect the beat-to-beat interaction of LV filling pressures and ventricular compliance, making them sensitive to rapid alternations in ventricular preload and after load.

LAV which is an index of left atrial size[6] is directly exposed to LV filling pressures during diastole of Left ventricle. The LA acts as a conduit between the pulmonary vascular bed and the LV, receiving blood from the pulmonary veins and conveying it to the LV through passive and active filling.

In addition, the atrium acts as an efficient volume sensor, releasing natriuretic peptides and other neurohormones to the circulation as a consequence of increased atrial wall stress.[7] After opening of the mitral valve, the LA and LV diastolic pressures will rapidly equalize, and emptying of the LA will be determined largely by LV filling dynamics.

Left atrium is a thin walled structure and its dimensions are affected in consequence of increased LV filling pressures as in case of diastolic dysfunction.LA size is considered to be an expression of the diastolic burden, and increased LA volume usually reflects elevated ventricular filling pressure. As an adaptation to the decreased ventricular compliance following MI, LA pressure rises, increasing LA wall tension and stretching the atrial myocardium.

LAV also reflects the duration and severity of increased LA pressure.[8] In the setting of an acute MI, patients with higher chronic LV filling pressure and worse previous diastolic dysfunction have lower hemodynamic ‘cardiac reserve’ that helps to withstand an acute decrease in myocardial contractility.[8]

Early after MI, LA size has been shown to provide prognostic information incremental to clinical data and standard echocardiographic predictors of outcome.[9] In the acute phase post-MI LA size was a better prognostic predictor of outcome than transmitral Doppler indices.

Indeed, Doppler indices may be quite sensitive to acute changes in the loading conditions secondary to HF and/or to drugs.[8] LAV is likely to be less affected by acute hemodynamic changes and may represent a more stable indicator of the duration and severity of diastolic function and filling pressure over time.[10] LAV provides prognostic information in AMI.

If LA volume is normal, outcome is good, even if systolic function is depressed. This suggests that more favorable hemodynamics before infarction may enable these patients to withstand an acute decrease in myocardial contractility.[11] LAV obtained early, within the first 48 h of admission, is a powerful independent predictor of survival after acute MI.

Moreover, new findings include the fact that LAV becomes a significant independent predictor of mortality within the first year following acute MI and are even more powerful for predicting five-year survival, and that LA volume obtained early upon

admission is a more powerful independent long-term mortality predictor than LV volume.[12]

Baseline LA size is an independent predictor of death or hospitalization for HF in patients with high-risk MI.[13]

Objectives

To determine the frequency of patients with LVF in first STEMI and to compare the mean LAV in patients with and without LVF in first STEMI.

Operational Definitions

- **STEMI:** (Defined according to consensus document of The Joint European Society of Cardiology/American College of Cardiology Committee for the Redefinition of Myocardial Infarction).
- **LAV:** Measured by biplane area and length method from standard 4-chamber and 2-chamber views at end diastole.
- **LVF:** Patients will be assessed clinically by signs and symptoms and graded in Killip class I to IV(clinical signs and symptoms manifested by tachycardia, and tachypnea or dyspnea, fine crackles in the lung persisting after vigorous cough, elevated jugular venous pressure often accompanied by a third heart sound and hemodynamic compromise in class IV)

MATERIALS AND METHODS

This Cross sectional study was conducted at Department of Cardiology, Shaikh Zayed Hospital, Lahore from April 2013 to October 2013.

Sample Size

Sample size of 150 patients was calculated with 95% confidence level, 8% margin of error with taking expected percentage of LVF i.e.33.3% in patients presenting with first STEMI.

Sampling Technique

Non-Probability Consecutive Sampling

Inclusion Criteria

All patients of any gender with first STEMI with or without LVF.

Exclusion Criteria

Patients with congenital heart disease, valvular abnormality, pericardial disease, chronic atrial fibrillation/flutter and cardiomyopathy. (assessed on history, echocardiography and ECG findings)

Data Collection Procedure

A total of 150 patients fulfilling inclusion criteria were enrolled in the study from coronary care unit of SZH Lahore. All patients were assessed for LVF by sign and symptoms and those who developed, were graded according to signs and symptoms in relevant Killip class. A single cardiologist calculated LAV by standard technique at rest of each patient.

Data Analysis Procedure

Collected data was entered and analyzed using SPSS v22.0. The demographic variables included identification data and demographic characteristics. Quantitative data was described by mean, median, standard deviation and bar charts while qualitative data was described using frequency and pie charts. Paired sample t-test was used to check the significant of difference in left atrial volume. A p-value less than 0.05 was considered to be significant.

RESULTS

There were total 150 patients of which 80 (53%) were male while 70 (47%) were female with a mean age of 55.28±10.01 years. Majority of patients were within the age range of 40 to 70 years (Table 1).

When patients were evaluated for history of different factors it was revealed that diabetes was found in 105 (70%) of patients while 45 (30%) were non diabetic (defined according to WHO guidelines 2003) (Table 2).

Hypertension (defined according to JNC 7) was noted in 115 (76.7%) of patients (Table 3), while 35 (23.3%) were normotensive.68 (45%) of patients were smokers while 82 (54.7%) were non smokers (Table 4).

Most of the patients were negative for Hyperlipidemia (according to AHA guidelines) as it

was noted in just 38 (25%) of cases. Chronic kidney disease (defined according to guidelines) was noted in 43 (28%) of cases (Table 5).

Table 1: Distribution according to gender.

Gender	Frequency	Percent
Male	80	53.30
Female	70	46.70
Total	150	100.00

Table 2: Distribution according to diabetes mellitus.

Diabetes mellitus	Frequency	Percent
Yes	105	70.00
No	45	30.00
Total	150	100.00

Table 3: Distribution according to hypertension.

Hypertension	Frequency	Percent
Yes	115	76.70
No	35	23.30
Total	150	100.00

Table 4: Distribution according to being a smoker.

Smoker	Frequency	Percent
Yes	68	45.30
No	82	54.70
Total	150	100.00

Table 5: Distribution according to hyperlipidemia.

Hyperlipidemia	Frequency	Percent
Yes	38	25.30
No	112	74.70
Total	150	100.00

Left ventricular failure (assessed by signs and symptoms) was found in 56(37%) of cases while it was absent in 94(63%) of patients. In total 150 patients, 93(62%) were in Killip class I, 39(26%) were in Killip class II, 9(6%) were in Killip class III and 9(6%) were in Killip class IV. Among patients of LVF, 69 percent were in Killip class II, 16 percent were in Killip class III and similar figure was observed in Killip class IV (cardiogenic shock).

When diastolic dysfunction was analyzed by mitral inflow velocities, it was observed that among 56 patients of LVF, 9(16%) had grade I diastolic dysfunction, 33(58%) grade II, 13(23%) grade III and 2 (2%) had grade IV diastolic dysfunction.

Among 94 patients without LVF, 23(24%) had grade I diastolic dysfunction and 71(76%) had grade II diastolic dysfunction.

In total 150 patients, 32(21%) had grade I diastolic dysfunction, among which 28% had LVF and 72% were without LVF.103 patients (69%) had grade II diastolic dysfunction, among which 31% had LVF and 68% were without LVF.13 patients (13%) had grade III and 2 patients (2%) had grade IV diastolic dysfunction.

All patients with grade III and grade IV diastolic dysfunction had LVF. Interestingly among total 150 patients nobody had normal diastolic dysfunction.

Mean left atrial volume was almost the same in the patients with and without left ventricular failure i.e. 35.24±1.14 and 35.16±1.19. No significant difference in LAV among different grades of diastolic dysfunction was observed. However, an increasing trend in mean LAV was observed from grade II to grade IV diastolic dysfunction in patients with LVF in our study.

Table 6: Distribution according to chronic kidney disease.

Chronic Kidney Disease	Frequency	Percent
Yes	43	28.70
No	107	71.30
Total	150	100.00

Table 7: Distribution according to left ventricular failure.

Left Ventricular Failure	Frequency	Percent
Yes	56	37.30
No	94	62.70
Total	150	100.00

Table 8: Distribution according to Killip Class.

Killip Class	Frequency	Percent
1	93	62.00
2	39	26.00
3	9	6.00
4	9	6.00
Total	150	100.00

Table 9: Frequency of Patients in Different Grades of Diastolic Dysfunction with LVF.

Mitral Inflow Velocity	Frequency	Percent
Grade I	9	16
Grade II	32	58
Grade III	13	23
Grade IV	2	3
Total Patients	56	100

Table-10: Frequency of Patients in Different Grades of Diastolic Dysfunction without LVF.

Mitral Inflow Velocity	Frequency	Percent
Grade I	23	24
Grade II	71	76
Grade III	-	-
Grade IV	-	-
Total Patients	94	100

Table 11: Mean Left atrial Volume in Patients With and Without LVF.

Left Ventricular failure	Mean	N	Std. Deviation
Yes	35.2429	56	1.14731
No	35.1606	94	1.19625
Total	35.1913	150	1.17502

Table 12: Mean LAV in Different Grades of Diastolic Dysfunction in Patients With and Without LVF.

Mitral inflow velocity	Mean	N	Std. Deviation
Grade 1	35.5688	32	1.53716
Grade 2	34.9942	103	1.06106
Grade 3	35.7000	13	.60553
Grade 4	36.0000	2	0.00000
Total	35.1913	150	1.17502

Table 13: Mean LAV in different grades of diastolic dysfunction in patients without LVF.

Mitral inflow velocity	Mean	N	Std. Deviation
Grade 1	35.6087	23	1.63009
Grade 2	35.0155	71	0.98932
Total	35.1606	94	1.19625

Table 14: Mean LAV in different grades of diastolic dysfunction in patients with LVF.

Mitral inflow velocity	Mean	N	Std. Deviation
Grade 1	35.6182	11	1.28516
Grade 2	35.0258	31	1.12752
Grade 3	35.7500	12	0.61126
Grade 4	36.0000	2	0.00000
Total	35.3321	56	1.09181

DISCUSSION

This study was planned to determine the frequency of LVF in patients with AMI and to find the association of mean left atrial volume and LVF in first STEMI as a number of studies conducted internationally showed variable results while local data was lacking. Most of the previous studies which were conducted, had prospective analysis of association of LAV and long term morbidity and mortality.[14-16] No local or international study was available regarding the association of mean left atrial volume with LVF in first STEMI or lack thereof.

It has been demonstrated in a number of studies that LAV provides independent and additional prognostic value for long-term mortality and cardiovascular deaths in patients with AMI.[14-16]

In one previous study, when LAV was measured in initial 48 hours of presentation with STEMI, it was observed that patients with LAVI >32 ml/m2, had subsequently more admissions with heart failure (Killip score >2), compared to patients who had LAVI <32ml/m^2.[17] Neither the LV filling pattern nor the E/A ratio was significantly different between the groups with LAVI <32 ml/BSA and LAV >32ml/BSA .[17]

During a follow-up period of 5 years,

mortality rate was significantly higher in patients with LAVI >32 ml/m^2 as compared to patients with LAV <32ml/m^2, (34.5% vs. 14.2%, p<0.001). This difference was particularly significant after the first year of the acute MI .But there was no significant difference between the two groups in mortality rate during the first 30 days.[17]

The VALIANT Echo Study showed that post-MI early left atrial remodeling(during the first month) as well as late remodeling(at 20 months) was a significant predictor of all-cause mortality, HF hospitalization, or the composite outcome of all-cause mortality or hospitalization for HF.[18]But LA remodeling was not significantly related to age and baseline Killip class.[18]

In another study patients with Left atrial volume index >32 ml/m^2, had a higher incidence of congestive heart failure on admission (24% vs. 12%, p < 0.01).[19]

In our study, we failed to determine any association between mean LAV and LVF in AMI at initial presentation. Patients who presented with LVF and those without LVF didn't have any significant difference in mean LAV, measured within initial 48 hours.

We cannot compare our results with most of the above mentioned studies because in these studies, mean LAV was not compared in patients with and without LVF in AMI. Baseline LAV was used as a reference value and then left atrium volume was assessed as prognostic marker prospectively in these studies (i.e. after a period of one month, one year, 20 months and five year after AMI)[14,19] except in one study in which LAV index was assessed as prognostic marker at the time of presentation.[20] However mean LAV was never compared in AMI in patients with and without LVF in any previous study.

The reason why no significant difference was observed in our study between mean LAV of the two groups, may be because left atrial remodeling needs time after AMI as in one study there was no difference in mortality and morbidity at 30 days in patients with LAV>32/ml but a difference was observed at 20 months.[14]

In another study among patients in whom Doppler tissue imaging was performed in patients of AMI with LAV of less than and more than 32ml, no significant correlation was found between diastolic dysfunction and LA volume index.[20]

In our study no significant association between mitral inflow velocities and left atrial volume was found in AMI which is consistent with the older studies.[20]

Killp class of heart failure is significantly associated with increase left atrial volume on admission. Patients who were admitted with LAV >32ml had worse Killip class (>II) on admission.[19] In our study, no significant difference in LAV among patients of different Killip classes was observed which is not consistent with previous studies. However, an increasing trend in LAV was observed from Killip II to Killip IV in patients with LVF in our study. This may have become significant if the studied group was larger in number.

One interesting finding in our study is that no AMI had normal LV filling patterns. This finding is compatible with one previous study in which frequency of diastolic dysfunction after AMI was 96%.[21] But in another study, frequency of diastolic dysfunction after AMI was 58%.[22]

Limitations of study:

Regarding limitations of study:

1) Our study consisted of small number of patients.
2) We did not know the pre infarct size of the left atrium.
3) There was no follow up of the patients with LVF as in most of the previous studies; LAV was assessed as a prognostic marker prospectively because left atrial remodeling after AMI is associated with long term morbidity and mortality.[12,14]

These limitations may be avoided in further trials to strengthen the results of the current study.

CONCLUSION

From our study it is concluded that mean LAV has no impact on LVF in AMI. Larger studies are warranted to enhance our understanding of impact of mean LAV on left ventricular function in AMI. The utility of LA volume and function for

monitoring cardiovascular risk and for guiding therapy is an evolving science and may prove to have a very important public health impact.

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The Authors:

Wasim Ahmed
Registrar
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Qazi Abdul Saboor,
Associate Professor
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Adnan Salim Malik
Registrar
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Saulat Siddique,
Professor
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Amber Malik,
Professor
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Abubakar Hilal,
Registrar
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Husnain Bashir,
Registrar
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

Mohammad Abdul Rehmaan
Statistician

Corresponding Author:

Qazi Abdul Saboor,
Associate Professor
Department of Cardiology,
Shaikh Zayed Postgraduate Medical Institute,
Lahore

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Effect of Nutrition Education on Knowledge of Dietary Management of Diabetes and Hypertension among Nursing Students

Ayesha Saeed, Nimra Zahoor and Iqra Mushtaq
University of South Asia, Lahore Pakistan.

ABSTRACT

Introduction: Among the chronic diseases, diabetes and hypertension are two major public health concerns in a developing country like Pakistan faced with double burden of malnutrition. Both are strongly associated with healthy eating knowledge and are effectively controlled by dietary modification. **Objective:** The objective of this research was to assess the effect of nutrition education on knowledge of dietary management of diabetes and hypertension among nursing students. **Methodology**: A pretest and posttest quasi-experimental research design was used to provide nutrition education to 25 purposefully selected female first year nursing students aged 18-22 years. A structured questionnaire was developed by the researcher, including questions on demography and nutrition knowledge. After the pretest, interventions were administered in 3 sessions. The interventions included power point presentation and pamphlets developed through review of literature. Same questionnaire was used for posttest. Descriptive statistics were calculated for continuous variables. T-test was applied and a p-value < 0.05 was taken as significant. SPSS version 17 was used to analyze data. **Results**: Results showed that nutrition knowledge was adequate even at the baseline but after the intervention the scores improved markedly. Mean score at pretest was 11.160 (SD 2.44) which increased to 18.560 (SD 1.325) at the posttest. A comparison of mean scores yielded a statistically significant difference (t= -17.774, p=0.001, CI= -8.259- -6.540). **Conclusion**: It was concluded that nutrition education was effective to increase knowledge about dietary management of diabetes and hypertension among nursing students. Similar exercise can be employed to educate other healthcare providers.

Key words: diabetes, hypertension, dietary management, nursing students, nutrition education.

INTRODUCTION

Worldwide there is a continuous increase in the disease burden from cardiovascular disease, diabetes and related conditions of high blood pressure, high cholesterol, and excessive bodyweight. Once considered diseases of developed countries or of the elites in developing countries, they are now recognized as global problems[1]. Among the chronic diseases, diabetes and hypertension are two major public health concerns in a developing country like Pakistan faced with double burden of malnutrition. In Pakistan, cardiovascular diseases (heart disease and stroke) account for 34 percent of all deaths. Globally, Pakistan ranks sixth in the number of persons with type 2 diabetes[2]. One of the major causes of this high prevalence is the nutrition transition. Foods rich in vitamins, minerals, and micronutrients like fruits, vegetables, nuts and whole grains are being replaced by foods heavy in added or refined sugar, saturated fats, and salt. With economic growth people have adopted Western-style diet (fast food, soft drinks, processed foods, etc.), reduced physical activity, smoking, stress, rising inequality; all factors known to contribute to obesity and early onset of chronic diseases[3]. As diet and lifestyle play

a major role in onset of these diseases, treatment and prevention through dietary modification is also promising.

Regretfully in Pakistan, the patients have no facilities of counseling about dietary modifications in the hospitals. Healthcare providers like medical staff and dietitians can play a vital role in educating patients regarding dietary and lifestyle modification. Nurses too are in constant contact with the hospitalized patient and their relatives and can help a lot in counseling the patient if properly educated regarding dietary modification according to disease and physiological needs and state. The objective of this research was to effect of nutrition education on knowledge of dietary management of diabetes and hypertension among nursing students.

METHODS

Study design & Settings

The study was a quasi-experimental research design with a pretest and posttest without control group. The study setting was Nursing School of Services Institute of Medical Sciences (SIMS) Lahore. The institute was selected on the basis of convenience. The study was conducted in May 2016.

Sample

25 first year nursing students (aged 18-22 years) who volunteered to participate in the study were conveniently selected.

Instrument

A structured questionnaire used as pretest and posttest was developed by the researcher. It included demographic profile and 20 multiple choice questions on nutrition knowledge regarding hypertension and diabetes. The questionnaire was pretested for comprehension and reviewed by experts in field for content validity.

Intervention

Main interventions were two lectures given with the help of power point presentation. The content included brief introduction of disease, causes, symptoms, risk factors, role of food in prevention of disease, and dietary management of diabetes and hypertension. The students were asked to prepare visual aids and flow diagrams to elaborate on the topic as an activity. At the end they were given educational brochures summarizing the key concepts as a take home message.

Data collection procedure

After taking informed consent the students were asked to fill the structured pretest questionnaire. After the pretest, interventions were administered in 2 sessions. Two lectures were given on alternate days and at the end of the week students were assessed by administering the same questionnaire for improvement in knowledge regarding disease and related diet modification.

Ethical approval

Written approval was taken from the Principal of Nursing School of Services Institute of Medical Sciences (SIMS) Lahore. Written informed consent was obtained from participants and they were assured of anonymity and confidentiality of data. Purpose of the study was explained to them.

Data analysis

The data was analyzed by using Statistical Package of Social Sciences (SPSS) version 17. For the comparison of pre-test and post-test paired sample t-test was applied and a p-value < 0.05 was taken as significant.

Table 1: Relationship between Scores of Pretest and Posttest.

	Mean	S.D	R	P-value
Pre-test	11.1600	2.444	0.524	.007
Post-test	18.5600	1.325		

RESULTS

All of the participants were females aged 18-22 years. They were nursing students of first year. Their previous academic qualification was Intermediate (pre-medical group). Table 1 shows that pretest scores show a statistically significant strong positive correlation with posttest scores which means that participants who scored better in pretest scored better in posttest. A comparison of

means revealed that posttest scores were statistically different from pretest (t= -17.774, P=0.001) (Table 2).

Table 2: Comparison of Means of Scores of Pretest and Posttest.

	t	p-value	Lower	Upper
Pretest Post-test	-17.774	0.001	-8.25927	-6.54073

DISCUSSION

Nutrition is a recognized determinant of some chronic diseases. Yet most of the healthcare providers are not trained in nutrition to provide lifestyle and dietary counseling so disease progression could be intervened and alleviated. There is a compelling need to develop nutrition knowledge of health care professionals and to establish curriculum in the education, training, and continuing education for health care professionals[4]. So keeping this in mind the current study was designed to improve the nutrition knowledge of nursing students and to assess the effect of nutrition education on disease related knowledge among nursing students.

Nutrition education appears to be more effective when provided through multiple methods and sites, such as schools, workplaces, mass media, and health centers[1]. Therefore, the current study was carried out at the educational institute of the participants.

Increased nutritional knowledge seems to improve the nutritional practice. A cross sectional survey of 4512 doctors and nurses concluded that self-reported nutritional knowledge was inadequate among Scandinavian doctors and nurses[5]. The baseline nutrition knowledge of the nursing students of SIMS was adequate as identified by the pretest, yet there was margin for improvement. At the posttest, after intervention it was observed that there was a marked increase in nutrition knowledge of the participants. Computer-assisted diabetes nutrition education proved to be an efficient and effective technique for teaching basic nutrition concepts to medical students[6]. Nutrition training from a dietitian improves nutrition knowledge of Practicing Nurses. It also improves their confidence and is recommended to support their role in providing accurate and consistent dietary advice to patients[7]. In the current study, interactive, well designed and presented nutrition education sessions were conducted which helped in keeping the participants involved and improved their retention as evident by posttest results. The nursing students provided qualitative feedback that after the nutrition education they felt more confident in giving dietary advice. Early nutrition intervention can decrease complication, length of hospital stay, readmission rates, mortality, and cost of care[8]. Previous studies have also shown that collaborative and inter disciplinary programs with nurses and nursing students can be a valuable resource in education patients and improving health outcomes in hospitalized patients[9,10]. Thus it is anticipated that the participants will contribute to the improvement of the health outcomes in hospitalized patients in Pakistan.

CONCLUSION

It was concluded that nutrition education was effective to increase knowledge about dietary management of diabetes and hypertension among nursing students. Well presented and interactive method of teaching was found to enhance learning profoundly. Similarly other healthcare providers can be taught through continued education and workshops at their workplace so current workforce is empowered to improve the health of the nation.

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The Authors:

Ayesha Saeed
Senior Lecturer
University of South Asia,
Lahore, Pakistan.

Nimra Zahoor
M. Phil Scholars
University of South Asia,
Lahore, Pakistan.

Iqra Mushtaq
M. Phil Scholars
University of South Asia,
Lahore, Pakistan.

Corresponding Author:

Ayesha Saeed
Senior Lecturer
University of South Asia,
Lahore, Pakistan.
E-mail: ayeshasaeed1980@hotmail.com

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Gender Distribution of ABO and Rhesus Blood Groups among Medical Students of a Public Medical School in Lahore, Pakistan

Danyal Shafiq Butt,[1] Saima Malik,[2] Muhammad Zaeem Khalid,[1] Mona Aziz[2] and Ayesha Humayun[3]

[1]*Shaikh Khalia Bin Zayed Al Nahyan Medical and Dental College, Lahore*

[2]*Department of Heamatology, Shaikh Zayed Hospital, Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, SZ Federal Post Graduate Medical Institute, Lahore*

[3] *Department of Public Health and Community Medicine, Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, SZ Federal Post Graduate Medical Institute, Lahore*

ABSTRACT

Introduction: The identity of blood is unchangeable. More than 400 blood grouping antigens have been reported so far but the ABO and Rh is recognized as the major ones with clinical significance. **Objective:** To determine the frequency and gender distribution of ABO and Rh blood groups in medical students from a public medical school in Lahore, Pakistan. **Design:** Cross sectional study. **Method:** Blood group and Rh factor determination was carried out by Shaikh Khalifa Bin Zayed Al Nahyan Medical & Dental College Blood Donor Society, under the auspices of the department of Hematology & Blood bank, Shaikh Zayed Medical Complex. It was done by the antigen-antibody agglutination test and included all 481 medical students studying in the medical school. **Results:** The cumulative percentages of ABO and Rh blood groups among voluntary male and female medical student were : B +ve 33.7%, O +ve 30.4 %, A +ve 19.8%, AB +ve 7.9%, B –ve 4.2 %,O –ve 1.9%, AB -ve 1.2% and A –ve 1.0% while that for Rhesus –ve and Rhesus +ve blood groups was 8.3% and 91.7% respectively. B+ve (33.7%), the most prevalent blood group in both gender was 35.2% in males and 32.2% in females. O+ve (30.4%) was the second most prevalent one and was 32.2% in males and 28.6% in females. **Conclusion:** Blood groups in medical students follow the same frequency and distribution as of the general population of Punjab, predominantly B +ve and O +ve. Frequency distribution helps to inform blood banks about the proportional need for each blood group and also guides blood donor societies to collect proportionate samples of different blood groups following this population distribution.

Key Words: Blood groups, ABO blood group, Rh blood group, Blood donors.

INTRODUCTION

Utilization of blood is a regular necessity in a health care system. Need of blood is an essential and unavoidable requisite in the medical and surgical departments. There should be a constant, reliable and cost-free source of blood in the blood bank, that is tested and safe for the recipients. There is also the hassle and expense in arranging such donations by non-local patient's relatives so there should be an organized way to an easily accessible source of blood. This precluded the medical students as a fore most choice.

Identification of blood groups' distribution in various populations in context to blood banking is crucial but little being done in our population.[1] Medical students being a part of the hospitals can play an important role in blood bank reserves of blood in emergencies as well as whenever needed. Medical students are quite motivated with a very

positive attitude towards blood donation[2] and this can prove to be a time efficient and relatively safer way of collecting blood in blood banks. The use of extensive history from donors and advanced serological and nucleic acid testing (NAT) assays has greatly reduced infection from several transfusion transmitted pathogens.[3] Quality and safety standards of the blood bank are mandatory to reduce risk of transfusion infections.[4] A huge number of blood donors are lost due to extensive screening and standard protocols and procedures of blood donations in blood banks, necessitating the establishment of a healthy blood donor pool or source.[5] Gender-wise distribution of ABO blood groups

Students and young population is a big pool of healthy, voluntary blood donors and committed to further donation after further screening and serological tests as appropriated by the blood bank.[6] Determination of frequencies of ABO blood groups for blood banking, organ transplant and genetic studies is important and has already been established.[7]

Medical students make a pool of healthy voluntary blood donors in our country. They usually practice blood donation with an interval of eight weeks between donations at least, as per standard practice and guidelines.[8]

Shaikh Khalifa Bin Zayed Al Nahyan Medical and Dental College is a public sector medical teaching institute affiliated with Shaikh Zayed Hospital Lahore. It has an influx rate of hundred students per year. Data was collected from a pool of 481 medical students studying in all 5 years of medical college.

METHODS

A total of 481 medical students from Shaikh Khalifa Bin Zayed Medical & Dental College affiliated with University of Health Sciences, Lahore, Pakistan participated in this study voluntarily. The subjects included both male and females with no age restrictions. Inclusion criteria included MBBS Students who agreed to donate blood in the future. Participants were given a donor questionnaire which also gave the blood bank the authority to use the data and an agreement to use their donations as deemed appropriate by the Blood Bank. The questionnaire also included information regarding any present or past medical condition and past history relevant to blood donation. A 1.0-2.0 ml sample of blood was drawn from the antecubital vein of each subject in a disposable syringe, and transferred immediately to a tube containing ethylene diamine tetra acetic acid (EDTA). ABO blood grouping was determined by tile method using commercially prepared anti sera, anti A, anti B, anti AB (Plasmatec Kent, UK). Presence of Rh D antigen was determined by anti-D (Biotec Laboratories Ltd UK). For Rh-negative Du test was done. Blood was collected under WHO guidelines and screened accordingly for HIV, HBV, HCV and Syphilis. Subjects whose blood samples completely satisfied the screening criteria for HIV, HBV, HCV and Syphilis, according to WHO were included and a databank of these volunteer students was developed. Data was entered and analyzed using SPSS version 20.0.

RESULTS

Out of the total 481 subjects, 236(49.1%) were males and 245(50.9%) were females as shown in Table 1. The distribution of ABO and Rhesus blood groups in both genders are shown in Table 2. In a descending order, ABO and Rhesus blood groups in the total sample are; B +ve 33.7%, O +ve 30.4%, A +ve 19.8%, AB +ve 7.9%, B –ve 4.2%, O –ve 1.9%, AB -ve 1.2% and A –ve 1.0%. Total cumulative percentage of Rhesus –ve and Rhesus +ve blood groups was 8.3% and 91.7%, respectively.

Results exhibits, B +ve was the predominant blood group with a combined percentage of 33.7% and A –ve was the least common blood group with a total percentage of 1% comprising of only 5 subjects in the total sample and only present in male medical students.

B+ve (33.7%), the most prevalent blood group in both gender was 35.2% in males and 32.2% in females. O+ve (30.4%) was the second most prevalent one and was 32.2% in males and 28.6% in females. A+ve (19.8%) was 3rd most prevalent in males 19.1% and females 20.4%. AB +ve blood group was 10.6% in females as compared

to 5.1% among male students. B -ves in males and females were almost equal, 4.1%.

Table 1: Gender-wise distribution of subjects.

Gender	Frequency	Percent
Male	236	49.1
Female	245	50.9
Total	481	100.0

Table 2: Gender-wise distribution and frequency of ABO and Rhesus blood groups.

Blood groups	Male	Female	Total
A+ve	45 (19.1%)	50 (20.4%)	95 (19.8%)
A-ve	5 (2.1%)	0	5 (1.0%)
B+ve	83 (35.2%)	79 (32.2%)	162 (33.7%)
B-ve	10 (4.2%)	10 (4.1%)	20 (4.2%)
AB+ve	12 (5.1%)	26 (10.6%)	38 (7.9%)
AB-ve	2 (0.8 %)	4 (1.6%)	6 (1.2%)
O+ve	76 (32.2%)	70 (28.6%)	146 (30.4%)
O-ve	3 (1.3%)	6 (2.4%)	9 (1.9%)
Total	236 (49.1%)	245 (50.9%)	481 (100%)

DISCUSSION

This study not only created awareness among the health professional students about healthy blood donation but it also lead to the formation of databank of healthy, voluntary blood donor students at SKZMDC. Blood banking is the backbone of medical interventions in health system. Provision of safe blood to all in need of transfusion is one of the objectives of public health.

This survey was conducted for the first time in our institute and the distribution of blood groups were found to be very useful for identifying voluntary blood donors with different blood groups, especially the rare ones. A lot of research evidence is available on healthy, potential, voluntary blood donors to enhance and improve blood banking and transfusion facilities[9,10].

Studies on blood grouping in medical students or young voluntary blood donors are scarce, though enough literature on blood groups distribution in the general population globally and in Pakistan is available. In our study, we found the same prevalence of B+ve blood group (33.7%) as in a study on most prevalent blood groups in a Pakistan's major district. Least common blood group according to our study was A-ve but in this study it was AB–ve[11].

A study conducted to determine the frequency of various ABO and Rh (D) blood groups among voluntary blood donors in Rawalpindi/ Islamabad area of Pakistan showed the same results; B +ve being the most common blood group in voluntary blood donors[12]. Another study in District Dir Lower Khyber Pakhtunkhwa Pakistan, showed A +ve as the predominant blood group of the population[13]. However, a study conducted regarding distribution of AB0 and RH blood group alleles in different populations of southern Punjab, Pakistan showed no significant difference between ABO or Rh allele variation[14]. Another study conducted at Punjab Institute of Cardiology, Lahore, Pakistan showed the same dominance of B +ve in our population[15]. There is a need for blood groups mapping of our population and identify ethnic and regional differences in blood groups' distribution among Pakistani population and voluntary blood donors[16].

Our study showed that 49.1% were males and 50.9% were females, while in another study 55.6% of donors were male and other 44.4% were female[17]. A study conducted on medical students in Nepal showed that the most prevalent blood group was A +ve and O +ve as compared to B +ve in our medical students. The least common blood group was AB -ve in Nepal which was the same as in our medical student population[18]. Our sample showed blood groups B +ve 33.7%, O +ve 30.4 %, A +ve 19.8%, AB +ve 7.9%, B –ve 4.2 %,O –ve 1.9%, AB -ve 1.2% and A –ve 1.0% in a descending order of frequency. Female medical students formed 46.67 % of Nepalese Medical students whereas in our college 50.9% were females. The common finding in all studies included current research is the predominance of Rh +ve antigen on the blood groups.

A study conducted in Puducherry, India revealed that there was a positive attitude of medical students towards blood donation and a 100 % voluntary rate can be achieved through education regarding blood donation of these medical

students[19]. Our study aims to bring this fact forward and initiate such education system so as to make sure that educated personnel such as medical students play a vital role in the future of blood banking.

Another study conducted in medical and non-medical students in Nepal showed that medical students donated much less than the non-medical students[20], while in our study 96.2% participated in the survey voluntarily. Blood centers are able to recruit and process large numbers of blood donations to meet the demand for antigen-matched blood but we need to avail all options in an under resourced health system, as ours, to meet our blood banking needs[21]. A study conducted on blood donations in developing countries showed that certain themes like misinformation about blood donation, fear of blood donation, willingness to donate only for family and friends contributed significantly towards this blood donation attitude[22]. To improve this we need to educate the masses and utilize all potential blood donors at our disposal.

Our study indicates that 96.2% medical students volunteered to participate in this drive and agreed to donate blood in the future for the benefit of the patients. The predominant blood group was B +ve and females were the predominant donors. The blood groups follow the same frequency pattern as in the general population. This could be a very important source for the blood bank which needs blood for transfusion in emergency as well as in elective procedures. By organizing blood donation drives in all the medical colleges in Pakistan, blood banking can be improved to an immense level in terms of efficiency and resources. Also, a huge cohort can be gathered to improve knowledge regarding voluntary blood donation in medical students and also genotypes of such donors.

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The Authors:

Danyal Shafiq Butt
Medical Student
Shaikh Khalia Bin Zayed Al Nahyan Medical and Dental College, Lahore

Saima Malik
Postgraduate Student
Department of Heamatology,
Shaikh Zayed Hospital, Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, SZ Federal Post Graduate Medical Institute, Lahore

Muhammad Zaeem Khalid
Medical Student
Shaikh Khalia Bin Zayed Al Nahyan Medical and Dental College, Lahore

Mona Aziz
Professor
Department of Heamatology, Shaikh Zayed Hospital, Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, SZ Federal Post Graduate Medical Institute, Lahore

Ayesha Humayun
Professor
Department of Public Health and Community Medicine,
Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, SZ Federal Post Graduate Medical Institute, Lahore

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Correlation of Serum Ammonia and Serum Sodium Levels with Grade of Hepatic Encephalopathy in Patients with Cirrhosis of Liver

Munaza Javed, Khurram Saleem, Faisal Amin Baig and Mahwish Nida
Department of Medicine, University College of Medicine, University of Lahore.

ABSTRACT

Introduction: Commonest cause of cirrhosis of liver includes infection by hepatitis B and C viruses which lead to persistent inflammation and progressive fibrosis. **Objective:** To find the Correlation between the severity of Grade of Hepatic Encephalopathy with Serum ammonia and Sodium levels in patients of cirrhosis. **Place and Duration of Study:** Department of Medicine, Nawaz Shareef Social Security Hospital Multan Road, Lahore affiliated with University of Lahore from January 2016 to June 2016. **Methods:** 132 cirrhotic patients with Hepatic Encephalopathy were included in this study. Hepatic encephalopathy was graded according to the West Haven Criteria. Serum ammonia and serum sodium levels were evaluated in them. Serum ammonia was labeled as normal or high whereas Serum Sodium was divided into four groups (Group 1) > sNa 135mEq/l, (Group 2)131-135mEq/l, (Group 3) 126-130mEq/l, (Group 4) <125mEq/l. Ammonia and serum sodium levels were correlated with the severity of HE using Pearson coefficient correlation. **Results:** Out of the 132 patients 28, 30, 30 and 44 were in Grade I, II, III and IV hepatic encephalopathy, respectively. Serum ammonia was high in 40 patients and out of them 20% and 60% had grade III and IV HE. 29 patients had serum Na of less than 130mEq/l, out of them 72.41% were in grade III and IV of hepatic encephalopathy. Correlation of Serum Ammonia and Serum Sodium with Grade of hepatic encephalopathy was statistically significant with p value 0.01 for both. **Conclusion:** Higher Grades of hepatic encephalopathy are seen in patients having hyperammonemia and hyponatremia.

Keywords Hepatic Encephalopathy (HE), Serum ammonia, Serum Sodium (Na), Cirrhosis

INTRODUCTION

Commonest cause of cirrhosis of liver includes infection by hepatitis B and C viruses which lead to persistent inflammation and progressive fibrosis[1]. Hepatitis C virus (HCV) infection affects almost three percent of the world's population[2] and is a major cause of chronic hepatitis, cirrhosis and hepatocellular carcinoma[3]. Hepatic encephalopathy is a fatal complication of both acute and chronic liver failure [4] and a poor prognostic sign, with 1-year mortality rate of almost 60% [5].

HE is a neuropsychiatric syndrome whose exact etiology is still unclear[6]. Ammonia is toxic to the brain and is considered central to the pathogenesis of HE[7]. Astrocytes are the main site of ammonia detoxification.[8] Hyperammonemia results in microglial activation and Alzheimer type II astrocytosis[9], which causes exhaustion of the volume regulatory capacity of the astrocytes ultimately leading to low grade cerebral edema and HE[8,10.]. Advanced cirrhosis results in increased secretion of ADH causing impaired ability of the kidneys to excrete free water resulting in hyponatremia[11]. This hyonatremia lowers the levels of *myo*-inositol in the astrocytes resulting in cerebral edema and development of overt HE[12]. Hyponatremia in cirrhosis is associated with a high morbidity and mortality[13] and like ammonia is a marker of poor prognosis in patients with cirrhosis and in development of cirrhosis related complications[14].

Ammonia and hyponatremia result in low grade cerebral edema leading to HE which is

clinically manifested by attention deficits, alterations in sleep patterns, muscular in-co-ordination ultimately progressing to stupor, coma and seizures[15]. Hyperammonemia alone is not always responsible for causing hepatic encephalopathy and, at times, patients with hepatic coma have been found to have normal blood ammonia levels and vice versa[1,16]. Similarly according to Fredrick hyponatremia alone is also not sufficient to trigger HE a second hit like ammonia places osmotic stress on the astrocytes leading to cerebral edema[17].

Recent research points towards a synergistic role of hyperammonemia, electrolye imbalance and systemic inflammation in the development of overt HE[18,19]. Many National and International studies are available on the effects of serum ammonia and hyponatremia alone in the development of HE, but limited data is available on the effects of ammonia and hyponatremia collectively in the development of HE .The aim of our study is to find the effect of both serum ammonia and hyponatremia on the development of HE in patients with cirrhosis of liver presenting to a tertiary care hospital.

Objective

A single centered study to find the Correlation between severity of the grade of Hepatic encephalopathy with serum ammonia and serum sodium levels.

Inclusion criterion

All patients with Hepatic Encephalopathy due to chronic liver disease.

Exclusion criterion

Patients with Encephalopathy because of
Renal failure
Hypertension
Sepsis
CNS infections (Meningitis, Encephalitis)
Uncontrolled Diabetes

MATERIAL AND METHOD

132 patients in Hepatic encephalopathy due to chronic liver disease were registered after informed consent from patients or their relatives at Punjab Employee's Social Security Hospital affiliated with University of Lahore. Liver cirrhosis was defined by typical clinical features of decompensated liver cirrhosis coupled with ultrasonographic findings. Patients were examined for the clinical grade of hepatic encephalopathy within the first few hours of admission according to the West-Haven criteria[20].

Grade 1 Trivial lack of awareness, sleep disturbance, slowing in the ability to perform mental tasks.

Grade 2 Lethargy or apathy, inappropriate behavior, slurred speech, presence of asterixis .

Grade 3 Somnolence, confusion, disorientation to place.

Grade 4 Coma with or without response to painful stimuli.

Venous blood was analyzed for the measurement of Serum ammonia and Serum sodium levels within the first hour of admission. Ammonia was classified into two groups Normal and High. Serum Sodium was classified into four groups (Group 1) > 135mEq/l, (Group 2) 131-135mEq/l, (Group 3) 126-130mEq/l and (Group 4) <125mEq/l.

Analytical descriptive study design was employed to collect the demographic information and for results of laboratory reports. Data was recorded on questionnaire in first phase then entered into statistical package for social sciences (SPSS) version 20 for statistical analysis. The data contained both qualitative categorical variables and quantitative variables. Mean and standard deviation were presented for quantitative variables and percentages for qualitative variables. Pearson's correlation coefficient was employed to correlate Grade of HE with serum ammonia and serum sodium levels.

RESULTS

132 patients in HE because of chronic liver disease participated in the study. Out of which 70 (53%) were male and 62 (47%)were female. 101 patients (76.5%) patients were suffering from hepatitis C, out of them 55were male, 46 were female, 27 (20.5%) patients were suffering from Hepatitis B, 2 patients (1.5%) had both hepatitis B

and C, 2 patients (1.5%) had alcoholic liver disease (Table 1)

Of these 132 patients 28, 30, 30 and 44 patients were in the Grade I, II, III and IV HE respectively (Table 2). The commonest precipitating cause of HE in our study was constipation 36.4% followed by infection18.2%, upper gastrointestinal bleed 18.2% and dehydration 15.2% (Table 3).

Table 1: Cause of CLD

	No.	%	Gender		Cumulative Percent
			Male	Female	
HCV	101	76.5	55	46	76.5
HBV	27	20.5	13	14	97.0
HBV + HCV	2	1.5	0	2	98.5
Others	2	1.5	2	0	100.0
Total	132	100.0			

Table 2: Grade of HE.

Gender	Grade of HE				Total
	I	II	III	IV	
Male	12	22	14	22	70
Female	16	8	16	22	62
Total	28	30	30	44	132

Table 3: Precipitating factor of HE.

	No.	%	Valid Percent	Cumulative Percent
Constipation	48	36.4	36.4	36.4
Infection	24	18.2	18.2	54.5
Upper GI bleed	24	18.2	18.2	72.7
Dehydration	20	15.2	15.2	87.9
Worsening asictes	16	12.1	12.1	100.0
Total	132	100.0	100.0	

Serum ammonia level was normal in 92 patients (69.7%) and raised in 40 (30.3%) patients (Table 4). Of the 40 patients with raised serum ammonia level 16 were male and 24 were female. 24, 8 and 8 of the patients with raised serum ammonia levels were in grade IV, III and II of HE, respectively. Pearson Correlation was applied for Grade of HE and Serum ammonia level which was 0.01 and is statistically significant (Table 5).

Of the 132 patients 56 (42.4%) were in Group 1 (sNa >135), 47 (35.6%) in Group 2 (sNa131-135), 28 (21.2%) in Group 3 (sNa 125-130) and 1(0.8%) in Group 4 (sNa <125). In Group 1 Grade I, II, III and IV of HE were seen in 24, 24, 4 and 4 patients, respectively. In Group 2 Grade I, II, III and IV of HE were seen in 4,6,17 and 20 patients respectively. In Group 3 out of the 28 patients 8 and 20 patients were in Grade III and IV, respectively. The 1 patient in group 4 was in Grade III HE (Table 6). Pearson coefficient correlation was applied between HE and serum sodium level which was 0.01and is statistically significant (Table 7).

Table 4: Serum Ammonia Grade of HE

Serum ammonia	Grade of HE				Total
	I	II	III	IV	
Normal	28	22	22	20	92
Raised	0	8	8	24	40
Total	28	30	30	44	132

Table 5: Pearson Correlations.

		Grade of HE	Serum Ammonia
Grade of HE	Pearson Correlation	1	.420**
	Sig. (2-tailed)		.000
	N	132	132
Serum Ammonia	Pearson Correlation	.420**	1
	Sig. (2-tailed)	.000	
	N	132	132

**Correlation is significant at the 0.01 level (2-tailed).

Table 6: Serum Na and Grade of HE.

Serum ammonia	Grade of HE				Total
	I	II	III	IV	
Group 1	24	24	4	4	56
Group 2	4	6	17	20	47
Group 3	0	0	8	20	28
Group 4	0	0	1	0	1
	28	30	30	44	132

Table 7: Pearson Correlations.

		Grade of HE	Serum Na
Grade of HE	Pearson Correlation	1	.667**
	Sig. (2-tailed)		.000
	N	132	132
Serum Na	Pearson Correlation	.667**	1
	Sig. (2-tailed)	.000	
	N	132	132

**. Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

Our study demonstrated worsening of Grade of HE with higher levels of ammonia this is similar to an Egyptian study by Abidullah Khan et al. in which 86.5% of cirrhotics had HE, out of these 67.3% patients had hyperammonemia and out of them 34.8% and 25.2% patients had Grade III and IV HE[1]. Similarly Qureshi et al. in their study demonstrated 36 patients to be having severe hyperammonemia and HE, 31 of them were in grade IV of HE [21]. These results are similar to our study in which 60% of the patients with raised ammonia level had grade IV HE thus pointing towards to a direct relation between increased serum ammonia level and deeper grade of HE. In another study Bhatia et al. measured serum ammonia levels in patients of acute liver failure; their findings were also consistent with our findings[22]. Our study demonstrated a direct association between venous ammonia and HE whereas. Mehmood et al. measured total ammonia levels in arterial and venous blood and calculated partial pressures of arterial and venous ammonia in cirrhotics there results were consistent with our findings, furthermore they added that partial pressure of ammonia in venous blood followed by venous ammonia were more strongly associated with Grade of HE[23].

Results contrary to our findings have been demonstrated by Tarnah et al who found no correlation between the grade of HE and serum ammonia levels instead they have documented inflammation/SIRS to be associated with severe HE[18]. Similarly Kundra et al. have demonstrated no difference in ammonia levels between cirrhotic patients with or without HE[24]. Findings of both these studies are in contrast to the findings of our study, as of the 40 patients with raised ammonia level in our study 24, 8, 8 patients were found to be in Grade IV, III and II of HE, respectively .

Our study also demonstrated a significant role of hyponatremia in the development of HE as of the 29 patients with serum sodium less than 130 mEq/L, 21 were in grade III and IV of HE. The findings of our study are similar to Guevara et al. who documented hyponatremia to result in lower levels of *myo*-inositol (MI) in brain, these low MI levels in brain put patients at a greater risk of developing HE[12]. Many studies have reported Hyponatremia to be a marker of poor prognosis in patients with cirrhosis[25] and increase in the incidence of complications of cirrhosis[14,26] with increasing hyponatremia except for upper GI bleed[27]. Similarly Cárdenas et al. demonstrated hyponatremia to double the risk of death at 90 days in patients who had presented with acute decompensation of cirrhosis[28]

Our study has demonstrated a role of both ammonia and hyponatremia in the development and progression of HE which is much Similar to Bernadi et al. who documented HE to magnify in patients having hyperammonemia along with concomitant hyponatremia[29]. However these findings are in contrast to the findings of Tranah et al. and Jayakumar et al. 30 who described of a possible synergistic role of systemic inflammation and hyperammonemia in induction of neutrophil degranulation resulting in release of reactive oxygen species into the peripheral circulation which cross the blood brain thus resulting in HE[18,30]. Similarly Romero Gomez et al. have documented of a synergistic effect of multiple factors including hyperammonemia, inflammation, hyponatremia and renal insufficiency in the precipitation of HE in patients with acute on chronic liver failure[31,32], unlike our study in which only the effects of ammonia and hyponatremia were studied.

LIMITATION

Our study has several limitations Firstly, the levels of serum sodium and ammonia were correlated separately with HE there combined effect on HE was not judged. Secondly, markers of inflammation/ SIRS in the form of complete blood picture, blood cultures, C reactive proteins and ascitic fluid analysis were not performed in every patient and thus occult infection might have been missed. Lastly, most of our patients were in higher grades of HE and the outcome of their admission is not known which might have helped us in assessing the morbidity and mortality.

CONCLUSION

Hyperammonemia and hyponatremia result in

higher grades of HE and both have a negative influence on the development and progression of HE in cirrhotics.

Recommendations all patients presenting with HE should be evaluated and treated for presence of systemic infections along with ammonia lowering therapies and correction of electrolyte disturbances to reduce mortality in HE as newer research is pointing towards the concept of synergism in the development of HE.

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The Authors:

Munaza Javed
Assistant Professor
Department of Medicine
University College of Medicine, University of Lahore.
munaz_mji@yahoo.com

Khurram Saleem
Associate Professor
University College of Medicine,
University of Lahore.

Faisal Amin Baig
Assistant Professor
Department of Medicine
University College of Medicine.
University of Lahore.

Mahwish Nida
Assistant Professor
Department of Medicine
University College of Medicine,
University of Lahore.

Corresponding Author:

Munaza Javed
Assistant Professor
Department of Medicine
University College of Medicine,
University of Lahore.
munaza_mji@yahoo.com