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## Air Pollution and Health Hazards: A Menacing Situation in Pakistan

Iqbal Hussain Udaipurwala

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With the increasing urbanization and industrialization around the globe, the problem of air pollution is also increasing exponentially. At one end it is causing depletion of ozone layer and global warming and on the other side responsible for health related issues. It is estimated that around 7 million deaths are taking place due to air pollution per year in the whole world.<sup>1</sup> The effects on human health are not only physical on respiratory tract, nervous system, immune system, cardiovascular system etc but also it can cause psychological disorders and insomnia. There are many types of air pollutant as well as its source of origination which include CO<sub>2</sub>, CO, different oxides of nitrogen (NO, NO<sub>2</sub>, N<sub>2</sub>O), sulphur dioxide, volatile organic compounds (toluene, benzene, ethylbenzene, xylene), formaldehyde, culturable airborne bacteria, ozone (O<sub>3</sub>), black carbon and particulate matter.<sup>2</sup>

Particulate matter (PM) in the air is one of the most dangerous air pollutant the world is facing now a days. It is classified according to its size into; PM<sub>10</sub> which is particulate matter of less than 10 µm, PM<sub>2.5</sub> having size less than 2.5 µm and PM<sub>1</sub> having size less than 1 µm. Similarly the source of origin for these particulate matter also varies widely from both natural and human activity based. The natural source of origin may include volcanic and desert dust, sea or ocean aerosol and fire related products. Similarly human activity related particulate matter originates from combustion of different fuels like in house-hold cooking, vehicles or industries.<sup>3</sup> The larger particles PM<sub>10</sub> remain suspended in the air and usually do not go beyond upper respiratory tract while the smaller sized particles PM<sub>2.5</sub> may reach to lower respiratory tract till the terminal bronchioles and alveoli. The even smaller particle (PM<sub>1</sub>) may cross the epithelial barriers and can reach to blood stream. These smaller particles (PM<sub>1</sub>) are associated with more damage to human health than PM<sub>2.5</sub> and reduce more years from life expectancy.<sup>4</sup> Smog is a special type of air pollution that decreases visibility and the term is derived from two words; smoke and fog. It is mainly produced when the sunlight react with the nitric oxide in the air along with volatile organic compounds

(VOC). The main source for nitric oxide in the air is from combustion of fuel and coal.

The problem of air pollution is not only limited to outdoor atmosphere, the indoor air pollutant are also significantly raised as in most studies conducted on indoor air quality.<sup>5</sup> Faulty air conditioning system and lack of proper ventilation are the main cause for indoor pollution, as these pollutants are re-circulated again and again. The indoor pollutants are mainly derived from paints, furniture, electrical appliances, cleaning supplies, smoking and cooking. Many studies show that concentration of the formaldehyde in indoor air is quite raised and is mainly formed by paints, furniture, flooring etc. In major cities of Pakistan, corporate offices, shopping malls/plazas and even small shops and houses are utilizing central air conditioning system. Proper attention to cleaning of these air conditioning system is not paid, resulting in reduced indoor air quality level.

Many international agencies surveys show that air quality index of many cities of Pakistan have pollution well above the WHO standards. However, there are limited scientific studies available in the literature. One recent study conducted in the Lahore city shows alarmingly higher levels of all air pollutant including PM<sub>2.5</sub>, PM<sub>10</sub>, formaldehyde and volatile organic compounds in the busiest residential and commercial area.<sup>5</sup> Another study conducted in Peshawar also shows that concentration of nitrogen dioxide (NO<sub>2</sub>) and particulate matter were elevated well above the normal levels.<sup>6</sup> More scientific studies are required in this regard in different rural and urban area of Pakistan. Recently, newspapers are packed with headline news of heavy smog affected areas in different cities of Punjab including Lahore. The outrageous rise in vehicles, unchecked urbanization, uncontrolled growth of industries and vast deforestation are the main factors responsible for this alarming situation in Lahore.<sup>7</sup> Government has imposed many restrictions to reduce smog in Lahore city like declaring Monday as a routine weekly holiday with Saturday and Sunday, 50% attendance in offices and 50% work from home.

Recently, the world has seen a harmful and lethal pandemic in the form of COVID-19. The transmission, morbidity and mortality of COVID-19 has been associated with both individual susceptibility and the ambient environmental conditions.<sup>8</sup> Several studies had shown an association of outdoor and indoor air pollution with transmission of corona

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virus, having direct unfavorable effect and concluded that measures to reduce air pollution will also reduce burden of COVID-19.<sup>9</sup> Exposure, both short term and long term, to the air pollutants like CO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>2.5</sub> are associated with increase in incidence and overall mortality due to COVID-19. However, lockdown imposed globally during this pandemic has positive effect on the air pollution and ambient atmosphere. During lockdown most of the industries were shut down, traffic on road decreased to very low level, offices, shops and malls have limited timings and majority of people were at home, thus reducing emission of toxic gases. Air quality level improved in all areas where the lockdown was very severe and strict. At present, this pandemic is at its lowest level and the world is going back to its normal routine, thus again increasing production of toxic air pollutants. At this time, we have to think again and follow many of the restrictions that we followed during COVID-19 to improve our air quality level.

Tourism is one of the best earning business now a days and many countries of the world are only dependent of it. The tourism industry in Pakistan is also increasing at a good pace especially in northern areas to improve overall economy of our country. Majority of the northern areas of Pakistan are beautiful, natural and raw with an excellent air quality level. But increased tourism and human flow in these areas will affect its natural beauty with increasing production of toxic air pollutants that will harm its air quality level. More road will be developed and more hotels will be raised to cater these tourists and for all these purposes, deforestation is required. Trees are very essential and crucial for maintaining air quality level as it clean the air by absorbing CO<sub>2</sub> and other toxic gases. Though, trees are also affected by air pollution especially particulate matter and black carbon. Deposition of these on the trees lead to inhibition of photosynthesis, protein synthesis and vulnerability to micro-organisms and insects.<sup>10</sup> All should be done to reduce air pollution in these areas because at one end it will destroy and damage environment of these areas and country as a whole and on the other hand will reduce tourism itself. Studies in the developing countries have shown that deteriorating air quality level is the main factor in reducing number of tourists and overall revenue generation.<sup>11</sup>

To conclude, like many countries in the world, Pakistan is also facing a hazard of air pollution and smog especially in urban areas but also increasing in rural and tourist areas. Every effort should be done to constitute rules and implement it to reduce air pollution. Urbanization can be reduced by uplifting the rural areas, so people will not move to cities for financial reasons. Industrial gases and waste emissions must be controlled by proper disposing mechanism. Traffic jams in the cities increases vehicular emission, so unhindered flow of traffic must be ensured. Peoples are encouraged to work from home as far as possible and un-necessary inflow in the offices can be reduced by online services. Deforestation

should be controlled by strict actions and further tree plantation derives to be carried out.

#### Authors Contribution:

**Iqbal Hussain Udaipurwala:** Substantial contributions to the conception critically evaluation of intellectual content, final approval of the version to be published

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## Effects of Chemical Composition of Cholesterol and Pigment Stones on the Gallbladder Mucosa

Sanum Ali, Shahid Rasul, Surrendar Dawani, Sarah Zahid, Sehrish Hussain, Ovais Sarwar, Tanweer Fatima, Zainab Tariq

### ABSTRACT:

**Objective:** To compare the effect of chemical composition of cholesterol and pigment stones on gallbladder mucosa.

**Study design & setting:** This comparative cross-sectional study was conducted in the Department of Anatomy, BMSI, JPMC, Karachi, Pakistan, from April to September 2021.

**Methodology:** Total n= 120 gallbladder specimens were collected after cholecystectomies in 10% formalin. Gross morphological features of gallbladder and stones were observed. Specimens were processed and 5µm sections from fundus, body & neck of gallbladder were stained and examined for microscopic changes. Chemical analysis of stones was carried out to differentiate between cholesterol & pigment stones.

**Results:** We evaluated different histomorphological alterations in gallbladder with reference to both type of gallstones. Muscular wall thickness in pigment stone group was noted to be (143.89±78.66) and in cholesterol group (158.37±83.95). Both pigment and cholesterol stone showed increased tendency of muscular hypertrophy. Mucosal ulceration, chronic inflammatory cell infiltration, capillary congestion and hyperplasia (p-value: 0.04) were observed in both type of stones. Statistical analysis showed that large cholesterol stones produce significant histopathological changes (p-value: 0.004); greater the size of stone, more profound was the mucosal hyperplasia. Rokitsansky-Ashcoff sinuses were predominant in gallbladders with cholesterol stone.

**Conclusion:** Gallstones cause series of histopathological changes ranging from chronic cholecystitis to pre-malignant and malignant changes. Hyperplasia was observed to be more frequent with long standing, large cholesterol stones.

**Key words:** Cholelithiasis, Gallstones, Gallstone disease, Hyperplasia.

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### INTRODUCTION:

Gallbladder is a flask-shaped viscus, firmly attached to the visceral surface of the right lobe of liver. It stores and concentrates bile secreted by the liver. It is lined by tall columnar epithelial cells, covered by duvet of mucous, which separates the epithelium from luminal contents<sup>1</sup>.

Gallstone disease (GSD) is a worldwide common health problem. According to the literature the prevalence of gallstones varies by region and ethnicity. Approximately 10-20% of adults in the United States are said to be affected by GSD, followed by European population with an estimated

prevalence of 15%<sup>2</sup>, while Hispanics and Amerindians from the US (25-30%) are said to be the most susceptible ethnic groups<sup>3</sup>. Developing countries such as Pakistan has also been facing the rapidly increasing burden of GSD, which is around 10.2%, this increase in the frequency could be associated with the consumption of carbohydrate rich diet and physical inactivity. It is also reported that prevalence rates vary with age, sex and ethnicity, with females being the most predominant gender especially during the fourth decade of their lives<sup>4</sup>.

Literature suggests that gallstone formation is favoured by factors including; biliary supersaturation of cholesterol or bilirubin, nucleation of mucous with bile salts and bile stasis due to gallbladder dyskinesia<sup>5</sup>. Gallstones can be classified into three main types on the basis of their chemical composition; cholesterol stones comprising of crystalline cholesterol monohydrate, pigment stones consist of bilirubin calcium salts and mixed stones which are the mixture of both types of stones. These stones can also be distinguished by their morphology e.g., cholesterol stones are large, oval and yellowish in colour, whereas, pigment stones usually appear as small, multiple and black coloured. Mixed stones are multiple, multifaceted and can be of variable size<sup>6</sup>.

Cholelithiasis manifest diverse microscopic changes, ranging from acute and chronic cholecystitis, xanthogranulomatous cholecystitis and cholesterosis in majority of specimens then proceeding to advanced pre-cancerous varieties in some cases, like hyperplasia, metaplasia & dysplasia, eventually leading to carcinoma<sup>7</sup>. As most of the gallstones exhibit irregular surfaces, their irritation is said to be responsible for the initiation of above-mentioned changes that patients harbouring gallstones for a longer duration are seen with a higher risk of developing gallbladder carcinoma, which although found rare but is the most common neoplasm of the biliary tract and ranks fifth among gastrointestinal cancers<sup>8</sup>. Due to lack of gallbladder serosal layer adjacent to liver, hepatic invasion and metastasis is common. As the survival rate is quite low i.e., around 5%, early diagnosis could increase life expectancy<sup>9</sup>. This study is our contribution to observe the effects of mechanical irritation as well as chemical composition of gallstones on gallbladder mucosa of patients with cholelithiasis. Proper examination of cholecystectomy specimens with respect to gallstone type and size could increase the chances of early diagnosis of Gallbladder cancer which may reduce the morbidity.

We evaluated various microscopic changes in gallbladder and investigated their association with age, gender, ethnicity, stone size & stone type.

#### **METHODOLOGY:**

This comparative cross-sectional study was conducted from April to September 2021, at the Department of Anatomy, Basic Medical Sciences Institute in collaboration with Surgical Units of Jinnah Postgraduate Medical Centre

(JPMC), Karachi, after getting ethical approval from Institutional Review Board of JPMC (NO.F.2-81?2021-GENL/57122/JPMC). Total 120 patients diagnosed with cholelithiasis of ages, genders and ethnicities were recruited in the study. A sample size of 120 achieves 80.055% power to detect the difference (P1-P0) of 0.0850 using a two-sided exact test with a significance level (alpha) of 0.05. These results assume that the population under the null hypothesis (P0) is 0.1000. Sample size was based on a similar study that studied the histopathological changes in the gallbladders of Indian patients with gall stones (prevalence rate (10%)<sup>10</sup>. Patients were divided into groups on the basis of gender, ethnicity and stone type. Autolyzed specimens and specimens from patients suffering from diseases other than cholelithiasis i.e., Hepatitis A & B, Primary sclerosing cholangitis and Gallbladder carcinoma were excluded from the study<sup>11</sup>.

Specimens were collected post cholecystectomy and fixed in 10% formalin for 24 hours. Sections were taken from fundus, body and neck of gallbladder after taking measurements (length\*width\*breadth of gallbladders & diameter of stones) and observing the gross morphological features of all specimens & stones. 5 µm thick sections were cut & stained with H&E. Microscopic analysis was performed under light microscope (Nikon Eclipse 50i; Japan) connected to video link digitalizing board system (DS Camera control unit- DS-L2). Two slides per specimen and three areas (fundus, neck & body) per slide were observed, (histology slides of normal human gallbladder from department of Anatomy was used as control). Histomorphological features examined were; mucosal ulceration, Rokitansky-Ashcoff sinuses, chronic inflammatory cell infiltration, capillary congestion & hyperplasia. They were scored on an arbitrary scale denoted by numbers as; nil (0), mild (1), moderate (2) & severe (3). Muscular hypertrophy was measured through Image J Fiji software and mean values were noted. Gallstones were sent for chemical analysis to JSMU lab and results were obtained to differentiate between cholesterol & pigment stones on the basis of their chemical composition.

Statistical analysis of data was done by using SPSS version 22. The comparison of quantitative variables such as; age, stone size and volume of GB was done by using Student t-test to compare their mean difference. The categorical data such as ethnicity, groups of stone type, stone size and stone number were compared for their association with microscopic findings by Chi-Square test of dependence. The results were considered significant at P-value <0.05.

#### **RESULTS:**

In the period of six months, total no: of specimens studied were 120, among which 109 were from females (90.83%) and 11 were from male patients (9.16%) (Table-1).

Out of 120, 90 patients had cholesterol stones (75%), having mean age of  $37.02 \pm 10.66$  and 30 patients had pigment stones (25%), having mean age of  $41.07 \pm 13.14$ .



Frequency of GSD was found to be more frequent in Urdu speaking people (43.33%), followed by Pathans (23.33%) and then Sindhis (15.83%). Cholesterol stones were the predominant type among all ethnicities.

Out of 90 specimens containing cholesterol stones, 24 were solitary, 8 had two, 5 specimens had three stones while 53 carried multiple stones with mean size of  $0.79 \pm 0.57$ .

In 30 specimens containing pigment stones, number of stones varied from solitary stone in 6 specimens while 3 specimens had two and multiple in the remaining 19 specimens with mean size of  $0.3477 \pm 0.098$  (Table-1).

This study depicted many microscopic alterations within the gallbladder. The details are presented in (Table: 2).

Out of 30 specimens containing pigment stones, 16.7% had mild, 63.3% had moderate & 20% were having severe mucosal ulceration.

Out of 90 specimens containing cholesterol stones, 31.1% had mild, 53.3% had moderate & 15.6% were having severe mucosal ulceration (p-value: 0.305) (Table. 2).

Out of 30 specimens harbouring pigment stones, 20% had mild chronic inflammatory cell infiltration, 66.7% had moderate & 13.3% had severe infiltration.

Out of 90 specimens harbouring cholesterol stones, 45.6% had mild, 50% had moderate and 4.4% had severe infiltration (p-value: 0.023) (Table. 2).

Mean size of smooth muscle within the gallbladder specimens was found to be of  $154.75 \pm 82.58$ .

Out of 30 specimens carrying pigment stones, 10% exhibited mild, 6.7% exhibited moderate and none showed severe hyperplasia.

Out of 90 specimens carrying cholesterol stones, 32.2% exhibited mild, 11.1% had moderate and 2.2% showed severe hyperplasia (p-value: 0.04) (Table. 2).

Rokitansky-Ashcoff Sinuses were more pronounced and deep with cholesterol stones (58.9%) than pigment stones (33.3%).

## DISCUSSION:

Cholelithiasis is regarded as the commonest cause of chronic cholecystitis and is responsible for severe mechanical and chemical irritation of gallbladder mucosa. This in conjunction with bile stasis and chronic inflammation may lead to premalignant changes within the gallbladder, which could culminate to carcinoma<sup>12</sup>. In this research we have tried to assess the histological changes in gallbladder in association with the chemical composition of gallstones, age, gender and ethnicity.

Table 1: Physical Parameters

Variables	Cholesterol (n=90)	Pigment (n= 30)	t-value	p-value
Age (years)	37.02±10.66	41.07±13.14	1.69	0.09
Stone size (cm)	0.7953±0.576	0.3477±0.098	4.22	0.001
Volume of Gallbladder (cm <sup>3</sup> )	28.23±18.43	29.09±23.023	0.207	0.836
<b>Gender</b>				
Male (n=11) (9.16%)	7	4	Chi - square = 0.834	0.361
Female (n=109) (90.83%)	83	26		
<b>Ethnicity</b>				
Urdu speaking (n=52) (43.33%)	36	16	Chi - square =8.38	0.45
Pathan (n=28) (23.33%)	24	4		
Sindhi (n=19) (15.83)	13	6		
Punjabi (n=9) (7.5%)	8	1		
Baloch (n=7) (5.833%)	5	2		
Balti (n=1) (0.833%)	1	0		
Hazara (n=1) (0.833%)	1	0		
Hindko (n=1) (0.833%)	0	1		
Kashmiri (n=1) (0.833%)	1	0		
Kathiawari memon (n=1) (0.833%)	1	0		
<b>Number of Stones</b>				
One (n=30)	24	6	Chi - square =0.834	0.361
Two (n=11)	8	3		
Three (n=7)	5	2		
Multiple (n=72)	53	19		

Table 2: Microscopic Findings  
Applied Chi- Square test

Variables			Mucosal Ulceration			Chronic Inflammatory Cell Infiltration			Hyperplasia			
			Mild	Moderate	Severe	Mild	Moderate	Severe	Nil	Mild	Moderate	Severe
Stone Type	Pigment (n=30)	Count	5	19	6	6	20	4	25	3	2	0
		%	16.7	63.3	20.0	20.0	66.7	13.3	83.3	10.0	6.7	0.0
	Cholesterol (n=90)	Count	28	48	14	41	45	4	49	29	10	2
		%	31.1	53.3	15.6	45.6	50.0	4.4	54.4	32.2	11.1	2.2
p-value		<b>0.305</b>			<b>0.023</b>			<b>0.04</b>				
Number of Stones (n=120 specimens)	One (n=30)	Count	10	12	8	13	15	2	20	4	6	0
		%	33.3	40.0	26.7	43.3	50.0	6.7	66.7	13.3	20.0	0.0
	Two (n=11)	Count	5	6	0	5	6	0	8	3	0	0
		%	45.5	54.5	0.0	45.5	54.5	0.0	72.7	27.3	0.0	0.0
	Three (n=7)	Count	2	5	0	4	3	0	4	3	0	0
		%	28.6	71.4	0.0	57.1	42.9	0.0	57.1	42.9	0.0	0.0
	Multiple (n=72)	Count	16	44	12	25	41	6	42	22	6	2
%		22.2	61.1	16.7	34.7	56.9	8.3	58.3	30.6	8.3	2.8	
p-value		<b>0.162</b>			<b>0.803</b>			<b>0.357</b>				
Stone Size (in cm)	0.20 to 0.70	Count	19	44	12	28	40	7	51	20	2	2
		%	25.3	58.7	16.0	37.3	53.3	9.3	68.0	26.7	2.7	2.7
	> 0.70	Count	14	23	8	19	25	1	23	12	10	0
		%	31.1	51.1	17.8	42.2	55.6	2.2	51.1	26.7	22.2	0.0
p-value		<b>0.711</b>			<b>0.312</b>			<b>0.004</b>				

Our results showed a trend that made it apparent that the prevalence of cholelithiasis is greater in females in comparison with males, this finding is consistent with a previous Pakistani study that reported, that among the population of 454 GSD patients, 73.6% were females of reproductive age, this may be due to elevated estrogen levels during the child bearing age, which increases cholesterol secretion and saturation of bile<sup>13</sup>. Moreover, a previous gender-based study is also in accordance with our findings that the number of females is higher than the males, however, the number of emergency admissions in hospital was seen more common in males. Although, there is no single article proving that this may be related to anatomical variants associated with gender<sup>14</sup>.

In terms of ethnic connection to GSD, we observed that majority of the cases diagnosed with cholelithiasis, were from Urdu speaking females (43.33%), migrated from Indo-Pak subcontinent region, and in this population cholesterol stones were predominant (table-1). Our results coincide with a study proposing significant association of ethnic group migrated to Karachi from northern Indian region which is said to be the stone belt of India. Oily and spicy food, sedentary habits and multiparity in women were suggested to be few associated reasons<sup>15</sup>, however, other ethnic groups e.g., Pathan and Sindhi speaking patients also showed an increased trend of developing GSD in our study (23.33%) and (15.83%) respectively.

Age has always been linked with an increased risk of developing gallstones. Our findings demonstrated that the most frequent age group was of 28-48 which is consistent with another local study where the peak incidence of GSD was observed in the age group of 26-35<sup>16</sup>. Moreover, these findings are also supported by an Indian study that reports greater incidence of GSD in the fourth decade of life<sup>17</sup>.

Regarding the microscopic findings, our observations revealed that moderate to severe mucosal ulceration was associated with both variety of stones, however we did not find any significant difference between cholesterol and pigment stone groups, when compared with each other (table-2). Literature suggests that this surface irregularity could be due to constant mechanical and chemical irritation of gallbladder mucosa by stones. We also observed that the size and number of stones were responsible to cause greater erosion and ulceration of the GB mucosa as suggested by other studies<sup>18</sup>.

An interesting observation in our study was regarding Rokitansky-Ashcoff sinuses. Their clinical relevance is important because adenomas could extend along these sinuses and stimulate the development of adenocarcinomas, likewise other studies also propose that the synthesis of cholesterol stone cause inward proliferation of the mucosa due to increase in the intraluminal pressure and weakening of the wall by distension, leading to the formation of Rokitansky-Ashcoff sinuses<sup>19</sup>.

In our study chronic inflammatory cell infiltration and capillary congestion were commonly seen with both type of stones but infiltration was extensively scattered in specimens containing cholesterol stones, some specimens also had multiple lymphatic nodules within the lamina propria to be more associated with cholesterol stones (table.2). Similarly, literature indicates that presence of stones triggers inflammatory response<sup>20</sup>.

According to current studies, chronic irritation by gallstones and their size increases the proliferation and mitotic activity of gallbladder epithelium resulting in precancerous changes like hyperplasia, which may progress to carcinoma<sup>21</sup>, our study displayed hyperplastic changes in 74 out of 120 specimens (61.6%) and it was profound in large size, multiple cholesterol stones (p-value < 0.05) (table-2).

The limitation of our study is that we cannot generalize our results regarding ethnicity because this is a single centre study and the sample size is not large enough.

### CONCLUSION:

This study revealed that gallstones cause series of histopathological changes ranging from chronic cholecystitis to pre-malignant and malignant changes. These changes are observed more with the long standing, large cholesterol stones. Urdu speaking females among age group of 28-48 were found to be more susceptible to GSD in our study.

Authors Contribution:	
<b>Sanum Ali:</b>	Corresponding author, research plan, experiment conduction, interpretation of data & analysis
<b>Shahid Rasul:</b>	Surgical relevance in write up & critical review
<b>Surrender Dawani:</b>	Surgical expertise
<b>Sarah Zahid:</b>	Experimental work, manuscript drafting and data analysis
<b>Sehrish Hussain:</b>	Literature review, data collection and experimental work
<b>Ovais Sarwar:</b>	Literature review, data collection and experimental work
<b>Tanweer Fatima:</b>	Literature review, data collection and experimental work
<b>Zainab Tariq:</b>	Statistical expertise and data analysis

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# Frequency of Esthetic and Periodontal Complications in Patients of Metal Ceramic Fixed Dental Prosthesis

Moiza Ijaz, Saira Ibrahim, Ammara Sharafat, Sameena Younis, Ayesha Satti, Abdul Rehman

## ABSTRACT

**Objective:** To determine frequency of complications in patients with fixed metal-ceramic dental prosthesis

**Study Design & Setting:** A cross-sectional study was designed and conducted on 141 post-treatment patients of Fixed Dental Prosthesis (FDPs) at Armed Forces Institute of Dentistry, Rawalpindi, Pakistan from Sept 2019 to Feb 2020.

**Methodology:** This study analyzed the results of 141 patients whose records were completed during study duration of 06 months at Department of Prosthodontics, Armed Forces Institute of Dentistry, Rawalpindi. Patients were called at three months follow up after provision of fixed dental prosthesis. Intraoral examination for presence of esthetic and periodontal complications was done by inspection, palpation and probing. Complications were graded according to severity.

**Results:** Esthetic complications with FPDs were observed in 13.47% (n=19) of the subjects, periodontal complications were encountered in 9.2% (n=13) and 77.3% (n = 109) showed no complications at all. No significant difference was observed in terms of type of complication encountered between males and females or between different age groups.

**Conclusion:** Complications in patients of metal-ceramic FDPs were observed in 22.7% patients only, of which 13.47% were esthetic and 9.2% were periodontal complications.

**Keywords:** Esthetics, Metal ceramic, fixed dental prosthesis, Periodontal

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## INTRODUCTION:

Fixed partial dentures is one of most commonly chosen treatment modality for restoration of incompletely edentulous arches as it serves a good means of substituting the missing

teeth.<sup>1</sup> Since metal ceramic fixed-dental prosthesis offer greater holding, firmness and stability, its demand to replace missing or lost teeth is on the rise both in the developed and developing countries across the world.<sup>2</sup> The placement of metal ceramic fixed restoration is one of the most widely done procedures in dental practices assuring predictable function and esthetics and proves a good value for money when properly planned and designed. However, poorly designed prosthesis not only fails but also damages the tooth and its supporting structures irreversibly.<sup>3</sup> Poor patient selection and improper execution of core buildup of tooth preparation, impression taking and cementation leads to early complications and subsequent failures in metal ceramic fixed dental prosthesis. Risk factors associated with these complications are inadequate history taking by the dentist, poor oral hygiene, smoking, inappropriate or poorly designed prosthesis and poor selection of position and number of units of the restoration.<sup>4-5</sup> A successful porcelain fused to metal crown satisfies biological, esthetic and mechanical concerns. Poor placement of margins of tooth preparation leads to severe periodontal problems and results in poor esthetic results.<sup>6</sup> Improved biological, mechanical and esthetic results can be obtained by proper patient selection, good treatment planning and proper placement of cervical finish line without violating biological width, thus, assuring the longevity of prosthesis and excellent oral health.<sup>7-9</sup> In a study conducted by Raza M et al, 140 patients were examined

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with 245 abutments, 58 males and 82 females with the mean age of  $42 \pm 8.9$  years, it was reported that the length of services ranging from 3-7 years with an approximate average of 5.4 years. The most commonly reported problems comprised of esthetic (10.2%) and periodontal (12.65%) problems.<sup>10</sup> The aim of this study was to determine frequency of complication, which will help prevent the occurrence of the same in future, ultimately resulting in better patient care. Results of this study can be applied in future for better treatment planning of the metal ceramic fixed dental prostheses which can further be implemented for improved patient care.

#### **METHODOLOGY:**

A cross sectional study was designed and conducted at the Armed Forces Institute of Dentistry, Rawalpindi, Pakistan from Sept 2019 to Feb 2020. Prior approval from Institutional Ethics Committee was obtained with ref # (905/Trg-ABP1K2 dated 17 Aug 2019). Verbal and written consent was taken from patients enrolled in the study. The sample size for this study was calculated by using WHO-sample size calculator, where prevalence of complication associated with ceramic metal fixed dental prosthesis was taken to be 10.20%<sup>10</sup>, 95% level of confidence, 80% study power and a precision of 5%. Minimum required sample size was calculated to be 141 using WHO sample size calculator.

Data was collected using non probability consecutive sampling technique. Both female and male patients, aged 20-60 years having single unit or 3-unit Porcelain Fused to metal-ceramic fixed dental prosthesis were examined. Patients were called for follow up visit 3 months after provision of metal ceramic fixed dental prosthesis. Factors like caries, abutment fracture, prosthesis fracture and mesial/distal cantilever were not considered. Detailed history, complete intra oral examination of involved tooth/teeth was carried out comprising of inspection, palpation and probing to look for esthetic and periodontal complications.

Periodontal problems were assessed using Community Periodontal Index of Treatment Needs (CPITN) probe and was graded as follows:

- Grade I – Slight color change and/or edema but no bleeding observed on probing
- Grade II – Redness and edema with bleeding on probing
- Grade III – Significant redness and edema, ulceration with spontaneous bleeding

Esthetic problems were assessed by both researcher and the patient himself and will be graded as follows:

- Grade I – Unacceptable to patient only
- Grade II- Unacceptable to researcher only
- Grade III- Unacceptable to researcher and patient

The data was entered into IBM SPSS (version 23.0) for analysis. To analyze the qualitative and quantitative variables, descriptive statistics were used. For qualitative variables like gender, esthetic and periodontal causes frequency and

percentage was calculated. For quantitative/continuous variables including age, the mean/standard deviation was calculated. Categorical group comparisons were made by using Chi-square test or Fischer exact test as applicable. Effect modifiers including age and gender were controlled by stratification and sub-group analysis. P value of less than or equal to 0.05 were considered significant.

#### **RESULTS:**

There were 141 patients enrolled in the study. Out of 141, 69 (48.9%) were males and 72 (51.1%) were females with a mean age of  $39.54 \pm 12.94$  years. Baseline characteristics of study participants were given in table 1. Esthetic complications with FPDs were observed in 13.47% (n=19) of the subjects while periodontal complications were encountered in 9.2% (n=13) of the patients as shown in Figure 1. On the contrary, remaining 77.3% (n=109) showed no complications at all.

Distribution of esthetic and periodontal complications in terms of severity grading among study participants is given in Table 2. For the purpose of stratification, patients were distributed into two groups with respect to age i.e. 40 years or less and 41 years above. No significant difference was observed between  $\leq 40$  and  $> 40$  years' age groups in terms of severity of esthetic complication encountered ( $p=0.413$ ). On the other hand, a significant relationship was found between gender and grade III aesthetic complications i.e. more number of females experienced grade III aesthetic complications as compared to males who more commonly encountered grade I and II complications ( $p<0.001$ ) as shown in Figure 2a. In terms of periodontal complications, significant relationship was found between both age group and gender. Females were more likely to encounter grade III periodontal complications as compared to males who more commonly experienced grade I complications ( $p=0.011$ ), similarly patients with age more than 40 experienced grade II complications whereas those with age less than 40 years more commonly experienced grade I and III complications ( $p=0.002$ ).

#### **DISCUSSION:**

A study conducted by Ercoli C in 2021, determined the factors affecting the longevity of fixed-metal ceramic dental prosthesis, retainer, and abutments, in which it was concluded that the material, such as gold or cobalt-chromium alloy, used for the denture fabrication was the most important factor associated with the longevity and better clinical survival of prostheses. In the same study, it was also concluded that gender and the age of the patient had a significant affect the denture's overall lifetime. Similarly, it was also reported that the risk of failure of fixed metal-ceramic dental prosthesis significantly increases when the abutment tooth is treated endodontically.<sup>11</sup>

On contrary, some studies reported no significant association between higher age group of the patient and denture's

Table 1: Summary of baseline characteristics of study participants (n=141)

Characteristics	Frequency (n)	Percentage (%)
Age in years (mean±SD)	39.54±12.94	
Age range	40-60	
Age groups		
• ≤40 years	81	57.4%
• >40 years	60	42.5%
Gender		
• Male	69	48.9%
• Female	72	51.1%

Fig 1: Occurrence of esthetic (a) and periodontal (b) complications among study participants over three months follow up

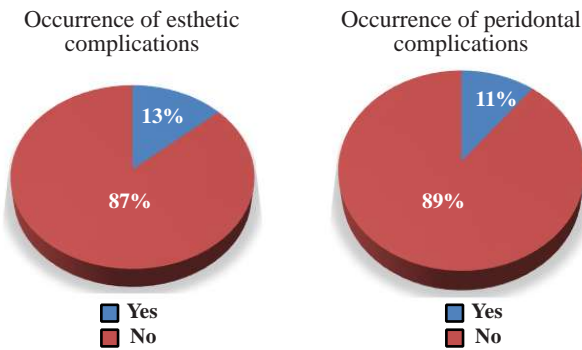
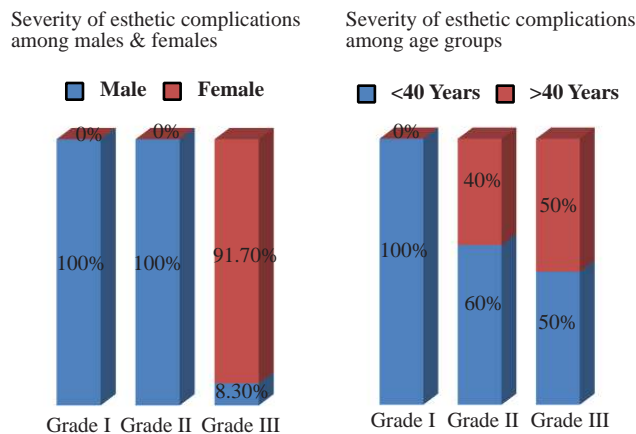


Table 2: Distribution of esthetic and periodontal complications in terms of severity grading among study participants

	Grading Levels	Frequency (n)	Percentage (%)
Esthetic Complications (n=13)	Grade I	5	38.5%
	Grade II	4	30.8%
	Grade III	4	30.8%
Periodontal Complications (n=19)	Grade I	2	10.5%
	Grade II	5	26.3%
	Grade III	12	63.2%

Figure 2: Comparison of occurrence of esthetic complications with respect to gender (a) and age groups (b).



longevity. A systematic review/meta-analysis conducted by Ioannidis G et al, in 2009, with an aim to investigate the relationship between patient age and survival rate of fixed prostheses, included studies published between 1985 - 2007, and a total of 2,811 patients with age range of 17 - 94 years, were included. The author reported in results that there was some evidences of higher failure rates among patients with middle-age group but no significant conclusion could be drawn in terms of increasing age to have an impact on the survival rate of fixed prostheses.<sup>12</sup>

The common complications related to prosthesis, length of services in term of success are largely determined at the time when a patient visits a dentist for repair or replacement of the existing restorations. The overall mean years of service for FDPs in this study were found to be 5.4 years, although metal-ceramic restorations are generally considered to be definitive restorations. These findings are similar to the findings reported in a study conducted by Oginni A et al<sup>13</sup> but the result was lower as compared to the result of studies conducted in developed countries.<sup>14</sup>

In studies conducted by Ikai H et al and Walton TR et al, the incidence of periodontal problems related to fixed-metal ceramic dental prosthesis is reported to be 23% and 27% respectively.<sup>15-16</sup> On the contrary, a local study conducted by Ghani F et al, reported 11.0% incidence of periodontal complications associated with fixed metal-ceramic dental prosthesis.<sup>17</sup>

The main factors that are responsible to produce the final esthetics includes arrangement of the teeth, tooth color, tooth shape and restoration quality. A study conducted by Abduo J et al reported poor esthetics to be the most frequent and significant cause of failure of restoration, followed by another important factor i.e. fracture of fixed-denture prostheses.<sup>13</sup> On the other hand, studies reported by western researchers identified caries to be the primary reason of FPD failure, but data of this study in addition to another local study conducted by Memon MR et al showed that decementation was the major factor responsible for FPD failure. Results of present study identified technical complications including de-cementation and unacceptable aesthetics and laboratory complications including fixed prostheses fabrication to be the common causes of FPD failure.<sup>18</sup>

In another study conducted by Bluma E et al, unacceptable aesthetics was reported to be only 7% and an important parameter to observe was, restoring aesthetics with MCFDPs was reported to be controlled by numerous factors relating to designing of tooth preparation, dentist's clinical/judgement skills for appropriate matching of the shade tab to the neighboring teeth and technician's skills to reproduce the form and exact required shade in the laboratory.<sup>19</sup> In this study, no association of complications with gender was found. Out of total study subjects 13.47% had esthetic complications and 9.11% had periodontal complications of fixed dental prosthesis.

In a study, patients were asked questions related to the time of service, nature of complaint, and materials used. Clinical examination was then performed. The percentage of the failures were periodontal disease (51%), shade mismatch (42%). The duration of service and oral hygiene was found to influence most of the complications especially periodontal disease, esthetics and occlusal wear.<sup>6</sup>In a study, the aesthetic and periodontal problems were more often associated with single crowns.<sup>22</sup>

One of the common complications or risk factors associated with the fixed prostheses is the presence of periodontal disease. Despite many researches carried out to know about the failure and complications of fixed prosthesis, the present topic of studying the relationship between the fixed prosthodontics and gingival problems is still insufficient and much research is required on this topic. Various researches associated gingival or periodontal problems with fixed prosthodontics to poor oral hygiene and lack of dental professional maintenance therapy. However the prevalence of complications was very low.<sup>21</sup>In our study, 77.3% study subjects had no complications.

#### CONCLUSION:

Complications in patients of metal ceramic fixed dental prosthesis were observed in 22.7% patients only, of which 13.47% were esthetic and 9.2% were periodontal complications. Age and gender of patients had no effect on the frequency of complication encountered.

#### Authors Contribution:

**Moiza Ijaz:** Concept design, methodology data collection, guarantor

**Saira Ibrahim:** Data collection and analysis

**Ammara Sharafat:** Data analysis and collection, manuscript writing

**Sameena Younis:** Manuscript writing

**Ayesha Satti:** Data collection and interpretation

**Abdul Rehman:** Data interpretation

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# Anatomical Variations of Vermiform Appendix on Plain MDCT and Its Association with Acute Appendicitis in Adult Urban Population of Karachi, A Tertiary Care Hospital Experience

Lubna Faisal, Rizwan Ajmal, Fatima Rehman, Zia ul Islam, Sadia Abdul Qayyum, Saima Athar

## Abstract

**Objective:** To evaluate the anatomical positions of vermiform appendix and its association with acute appendicitis on Multidetector computed tomography (MDCT).

**Study design and setting:** A cross sectional study based on hospital database was carried out in Department of Anatomy in collaboration with Department of Radiology, Liaquat National Hospital.

**Methodology:** A total of three hundred and six 306 adult urban patients CT axial images were evaluated retrospectively over period of 6 months from March 2021 to August 2021 who had abdominal MDCT scan for acute abdomen after getting approval from ethical committee to find out anatomical variations of position of vermiform appendix in a tertiary care hospital among adult urban Karachi population and its association with appendicitis. Data was analyzed using SPSS version 25. All categorical variables were summarized as frequencies and percentages.

**Result:** In present study 159(52%) were males and 147(48%) were females with mean age of 32.97 years. The subcecal anatomical position of vermiform appendix on MDCT was most common n=85(27.8%), followed by postileal n=78(25.5%), pelvic n=61(19.9%), postcecal n= 36(11.8%), preileal n=29(9.5%), ectopic n=17(5.6%). The association between appendicitis with anatomical position of vermiform appendix and age was analyzed by chi- square and was statistically significant (p =0.05). There was no significant association between position of vermiform appendix on MDCT and gender.

**Conclusion:** The subcecal position of vermiform appendix is most common on MDCT and the postileal position was more frequent in the inflamed group of vermiform appendix.

**Key words:** Anatomical variation, Appendicitis, Multidetector computed tomography, Vermiform appendix

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## INTRODUCTION:

The vermiform appendix originates from posteromedial wall of caecum in the large intestine. It is a narrow blind end like tube extension from caecum in the right lower abdomen approximately about 2cm in length just below the ileocecal valve.<sup>1</sup> It is supported by mesoappendix, which is a double layered fold of peritoneum suspending the organ from the terminal ileum. The appendix is most mobile structure of abdomen. An average length of appendix is 6-9 cm longer in males than in females. Anatomical variations in position of vermiform appendix can be associated with acute appendicitis.<sup>2</sup> Function of vermiform appendix is immunological. Its function is similar to tonsil which provides protection to upper GI tract. The appendix acts as a guard for small intestine from different microbes which are present in large intestine.<sup>3</sup> Appendix is an out pocket from caecum. Embryologically the proximal half of large intestine originates from midgut while distal half originates from hind gut. Superior mesenteric artery supplies the proximal half of large intestine while distal half is being supplied by inferior mesenteric artery. Both are the arteries of midgut and hind gut respectively.<sup>4</sup> A triangular shaped fold of peritoneum called mesoappendix extends throughout the whole length



of appendicular tube. It has free border through which vermiform appendix received its blood supply by appendicular artery which is a branch of ileocolic artery.<sup>5</sup> Appendicular vein drains venous blood which becomes ileocolic vein by joining with ceecal vein.<sup>6</sup>

The anatomy of appendix exhibit great variation in terms of position and length among different population, and still very few studies done which showed its variation in position associated with acute appendicitis. The earliest principle study on the position of appendix was done by Gladstone and Wakeley. This study concluded that 69.2% identified as postcecal, 27.5% identified as pelvic, 0.9% identified as preileal, 0.5% as post ileal and 18.6% identified as subcecal.<sup>7</sup>

Acute appendicitis is one of the most common causes of abdominal pain and is the most frequent condition leading to emergent abdominal surgery. Appendicular inflammation usually results in acute abdomen. Due to gut rotation during the 6<sup>th</sup> and 10<sup>th</sup> week of development and different stages of cecal development, appendix is located at different positions in the abdominal cavity as it originates from caecum.<sup>8</sup>

Over the last few decades, CT is considered as most accurate and useful diagnostic tool for acute abdomen.<sup>9</sup> There is remarkable increase in preoperative CT scans from 18% in 1996 to 93% in 2006, with very low false negative rate 0%.<sup>10</sup> CT criteria for appendicitis include an enlarged appendix of greater than 6 mm in diameter, greater than 2mm thickness appendiceal wall, pericecal inflammation with fat stranding, appendiceal wall enhancement, the presence of appendicolith – a calcified deposit in appendix in approximately 25% of patients.<sup>11</sup>

Plain MDCT is extremely useful for visualizing the appendix. MDCT is an excellent modern technique to diagnose and allow images of high resolution for whole abdomen with cheap rates than MRI.<sup>12</sup> This study will assess the position of appendix and its association with acute appendicitis in adults on Plain MDCT (Multidetector computed tomography). MDCT is simple procedure with no intravenous or rectal administration of contrast material due to this it gains popularity for the fast detection of normal and abnormal anatomical position of vermiform appendix. Multidetector computed tomography is modified and advance form of CT scan and is highly diagnostic for patients with suspected acute appendicitis.

Traditionally clinical diagnosis was used to make final diagnosis for acute appendicitis. With recent advancements in modern technologies, CT evaluation is now considered a definitive diagnostic tool. Various researches have been done on anatomical position of vermiform appendix on dissected bodies, during open appendectomy and postmortem but there is relative lack of data on MDCT which is innovative imaging modality on position wise frequency of vermiform appendix and its association with appendicitis in adult urban

Karachi population. The purpose of this study is to enlighten the different anatomical variations of vermiform appendix and to determine its association with appendicitis, which aids clinicians and surgeons in performing safe appendicular surgeries.

#### **METHODOLOGY:**

The study was conducted in Department of Anatomy and Department of Radiology in a tertiary care hospital Liaquat National Hospital and Medical College, Karachi. The duration of study was 6 months after getting approval from Ethical review committee (Ethical committee no: Ref: App#0633-2021LNH-ERC) from March 2021 till August 2021. Between the period of March 2021 till Aug 2021, all adult patients came to an emergency department with a clinical suspicion of appendicitis with typical presentation including complain of pain in right lower quadrant or right iliac fossa, nausea, vomiting, rebound tenderness and fever with elevated WBC count or atypical presentation that is absence of at least one of the classic findings of acute appendicitis and all women with normal gynecological examination who had MDCT examination performed were analyzed in our study as it was retrospective cross sectional study.<sup>13</sup>

A total of three hundred and six (306) patient medical records and CT images were identified and reviewed. One year MDCT scan (16 slice Toshiba) of both gender patients was included and were divided into three groups according to age values 18-25years, 26- 35 years =35 years of age. We excluded all patients in this study whose MDCT showed perforation of vermiform appendix, patients who had previous history of appendectomy and all pregnant females. The mandatory consent from patients for this study was ignored because of retrospective data collection from database on Proforma using Microsoft excel sheet. Field of view (FOV) for scanning was included from the area starts with level of diaphragm to pubic symphysis for all patients. The anatomical findings of vermiform appendix were interpreted retrospectively in collaboration with radiologist by evaluating CT axial images along with coronal of 1.5mm thickness and sagittal reconstruction.

Data was entered on a VITREA work station. All demographic data was entered on designated Proforma, Microsoft excel was used and results were analyzed on SPSS version 25. Tables were used for presentation of results. Frequencies and percentages were used to summarize all categorical variables. Association between position of vermiform appendix and appendicitis, association between age and appendicitis was analyzed by chi- square test. P-value of < 0.05 was considered statistically significant.

#### **RESULTS:**

Total 306 patients (159 males and 147 females) were subjected for MDCT in this research project. Position of vermiform appendix anatomically was noted on the basis of localization on MDCT. Age groups were divided into

three categories. Age: 18-25 years, 26- 35 years, =35 years. Most common position found in this study was subcecal 27.8% followed by postileal 25.5%, pelvic 19.9%, postcecal 11.8%, preileal 9.5%. Total 5.6% ectopic positions were recorded on MDCT. (Table 1)

The 26-35 year old age group followed by 15-25 year old urban adult population of Karachi presented most frequently to a tertiary care hospital for pelvic pain, lower abdominal

pain, right iliac fossa pain and lumbar pain. No statistically significant association was found between anatomical variations of positions of vermiform appendix and patient's age p- value (0.559). (Table 2a). In our study overall, out of total 306 scans, 68 scans detected by MDCT showed appendicitis. Significant statistical association was found in this study between appendicitis and age of patient p- value (0.039). (Table 2b)

The most common position of vermiform appendix in males was subcecal n=48(56.5%) in this study followed by postileal n=36(46.2%) followed by pelvic n= 28(45.9%), postcecal n= 21(58.3%), preileal n=17(58.6%) and ectopic n=9(52.9%). In females it was observed on MDCT postileal n=42(53.8%) followed by subcecal n=37(43.5%), pelvic n=33(54.1%), postcecal n=15(41.7%), preileal n=12(41.4%) and ectopic n=8(47.1%). There was no significant association between gender and anatomical position of vermiform appendix p- value (0.586). (Table 3)

In this study a total of 306 patients were included, among them it was found on MDCT that 68 patients also had appendicitis diagnosed on the basis of diameter and wall thickness of vermiform appendix. Statistically significant association was found by chi-square between appendicitis and positions of vermiform appendix. (Table 4)

Table 1: Demographic characteristics, anatomical position of vermiform appendix among adult urban Karachi population

	Variable	n, %
Gender	Male	159,52%
	Female	147,48%
Age(years)	=25 years	62,20.3%
	26- 35 years	133,43.5%
	=35 years	111,36.3%
Anatomical Positions of vermiform appendix	Postcecal	36 ,11.8%
	Preileal	29, 9.5%
	Post ileal	78,25.5%
	Pelvic	61,19.9%
	Sub cecal	85,27.8%
	Ectopic	17,5.6%

n= number of patients  
Anatomical variations of position of Vermiform Appendix

Table 2a: Association between Anatomical variations of position of Vermiform Appendix in relation to age

Age -Group	Position							P-value
	Ectopic	Pelvic	Post cecal	Post ileal	preileal	subcecal	Total	
18-25 years	2 11.8%	15 24.6%	6 16.7%	15 19.2%	8 27.6%	16 18.8%	62 20.3	0.559
26-35 years	9 52.9%	24 39.3%	16 44.4%	41 52.6%	12 41.4%	31 36.5%	133 43.5%	
>35 years	6 35.3%	22 36.1%	14 38.9%	22 28.2%	9 31.1%	38 44.7%	111 36.3%	
Total	17	61	36	78	29	85	306	

Table 2b: Association of Appendicitis with Age groups in adult urban Karachi population

Age Group	Appendicitis			P-Value
	Yes	No	Total	
<25 years	15 22.1%	47 19.7%	62 20.3%	0.039
26-35 years	37 54.4%	96 40.3%	133 43.5%	
>35 years	16 23.5%	95 39.9%	111 36.3%	
Total	68	238	306	

Table 3: Association between Anatomical variations of position of vermiform appendix in relation to Gender

Age -Group	Position							P-value
	Ectopic	Pelvic	Post cecal	Post ileal	Preileal	Subcecal	Total	
Male	9 52.9%	28 45.9%	21 58.3%	36 46.2%	17 58.6%	48 56.5%	159 52.0%	0.586
Female	8 47.1%	33 54.1%	15 41.7%	42 53.8%	12 41.4%	37 43.5%	147 48.0%	
Total	17	61	36	78	29	85	306	

Table 4: Association of Appendicitis with anatomical position of vermiform appendix in adult urban Karachi population

Position of vermiform appendix	Appendicitis			P-Value
	Yes	No	Total	
Ectopic	0 0.00%	17 7.1%	17 5.6%	0.019
Pelvic	12 17.6%	49 20.6%	61 19.9%	
Post cecal	8 11.8%	28 11.8%	36 11.8%	
Post ileal	27 39.7%	51 21.4%	78 25.5%	
Preileal	4 5.9%	25 10.5%	29 9.5%	
Sub cecal	17 25.0%	68 28.6%	85 27.8%	
Total	68	238	306	

## DISCUSSION:

Anatomical position of vermiform appendix is of great concern not only due to its evolutionary significance but also because of its surgical & pathological importance. Many controversies are present among the authors in context to different anatomical positions of appendix and due to their diverse classifications in the literature. According to many authors the vermiform appendix is the only organ of human body which has multiple anatomical positions in abdomen and its position varies from individual to individual. Due to lot of developmental disturbances during the midgut rotation, leading to multiple atypical positions of caecum and appendix. The normal position of vermiform appendix can be visualized by various non invasive imaging modalities. The MDCT has proved to be an excellent imaging modality for evaluation of vermiform appendix because of its excellent spatial resolution.<sup>14</sup> According to Gladstone and Wakeley study criteria, a total five anatomical positions of vermiform appendix were evaluated on MDCT (Multidetector computed tomography) in our study and its association with acute appendicitis.<sup>15</sup> In this study, we discussed classification based on anatomical position of appendicular tip on MDCT.<sup>16</sup>

In present study it was detected on MDCT subcecal is the commonest accounts for 27.8% (n=85), followed by postileal accounts for 25.5% (n=78) and pelvic accounts for 19.9% (n=61). The results of this study did not coincide with the results of previous studies by Wakely et al., (1933) and Tahir Iqbal et al., (2012) in which it was reported that retrocecal is the commonest position. This statement was not in accordance with the statistics which have been written in majority of Textbooks of Anatomy. Our study had similar findings with studies conducted in Korea. According to the results of Su Lim Lee et al, subcecal, postileal and pelvic were most commonly encountered than retrocecal position.<sup>17</sup> In cadaveric and postmortem studies gravity would be responsible to change the position of vermiform appendix, however in living subjects many factors e.g. gravity, gender, inflammatory condition, bowel pressure and gut movement would be responsible for the changing the anatomical position of vermiform appendix. The present study data might help for general experience of surgeons, histopathologist and anatomists.<sup>18</sup>

Gender wise the most common anatomical position of vermiform appendix in males was subcecal n=48 followed by postileal n=36 followed by pelvic=28. In females most common position of vermiform appendix noted was postileal n=42, followed by subcecal n= 37 followed by pelvic n=33. This result was not in contrast to the study Mohammadi S et al., 2017 who observed retrocecal position commonest in both genders followed by pelvic position.<sup>19</sup> Anatomically pelvis is divided into greater pelvis (false pelvis) which is considered as a part of abdominal cavity and lesser pelvis (true pelvis) which includes pelvic cavity. Female pelvis is more shallow and wide as compared to male pelvis. Higher

frequency of subcecal, postileal and pelvic positions of vermiform appendix in males would be due to deep greater pelvis. There is a difference in anatomical location of male and female vermiform appendix which could be due to descent of testes and ovaries in males in females respectively.<sup>20</sup>

In Kenyan population Hemed El –busaidy et al(2014) identified on cadavers with the mean values age of 40.46 ± 20.99 years retrocecal position was the most commonest followed by pelvic position.<sup>21</sup> In present study the findings were analyzed in three age groups 18-25, 26-35 years, = 35 years in adult urban Karachi population and it was found that subcecal is most common anatomical position of vermiform appendix in two age groups 18-25 and =35 years but not in 26 -35 years of age group. According to age groups in this study subcecal was the most common position n=16 in the age group 18-25 followed by pelvic n=15, postileal n=15, preileal n=8, postcecal n=6 and ectopic n=2 position of vermiform appendix. In the age group 26-35 years postileal was the most common position n=41 followed by subcecal n= 31, pelvic n= 24, post ceecal n= 16 and preileal n=12. In the age group =35 years subcecal was the most common position n= 38 followed by pelvic n=22, postileal n=22, postcecal n=14, preileal n=9 and ectopic n=6.

The present study showed statistically significant (p= 0.05) associations between patient's age and occurrence of appendicitis. Increased incidence of appendicitis in adult urban Karachi population occurs between age group 26 to 35 years followed by =35 years. This statement was in accordance with Ibrahim et al; 2012.

Due to emergence of latest modality MDCT coronal and axial images helps in demonstrating the whole anatomic configuration of caecum, ileocecal valve and appendicular base. Appendix is considered to be the only abdominal organ which is most variable in anatomical position as observed by Yashwant et al., in 2018.<sup>22</sup> MDCT gives 99% accuracy in discriminating normal and from infected appendix. By knowing common anatomical positions of vermiform appendix association with appendicitis on MDCT will help on time accurate diagnoses of acute abdomen. Accurate knowledge regarding the anatomical position of appendix can help to improve prognosis of disease.

As far as our knowledge no study has been conducted yet in relation to anatomical positions of vermiform appendix and its association with appendicitis on MDCT in adult urban population of Karachi. Our study determined significant association between position of vermiform appendix and appendicitis (P=0.05). Interestingly in this study we noticed that postileal position of vermiform appendix was found more frequent in the inflamed group, means post ileal position strongly associated with appendicitis.

Most of the studies which observed higher percentage of retrocecal appendix were done on cadavers whereas studies



carried out on live subjects revealed different percentage for anatomical position of vermiform appendix.<sup>23</sup>

The most common anatomical presentation of appendix is descending intraperitoneal. Total 17 ectopic positions of appendix were found in this study mostly sub hepatic and near to femoral canal location. Recent advancement in abdominal CT imaging (MDCT) is superior due to improved imaging and easily visualization of normal and inflamed appendix.<sup>24</sup> This advancement as discussed earlier helped a lot to identify normal and variants of appendix. In present study remarkable difference in anatomical position of vermiform appendix was noted on MDCT of patients with acute abdomen as compared to other cadaveric studies.<sup>25</sup>

Subcecal 27.8% position was most common in this study followed by postileal 25.5% followed by pelvic 19.9% as compared to pelvic position 41.83% followed by retrocecal 35.95% followed by postileal in Karachi population on cadaveric study done in 2017. In a study conducted by Usman Ali et al reported retrocecal position was commonly associated with appendicitis on ultra sonograms abdomen.

Limitations of this study were that the data was collected retrospectively, limited number of patient's MDCT identified and done in single institution. Although plain MDCT is an excellent diagnostic tool for appendicitis however radiation exposure limits its use particularly in pregnant women.

## CONCLUSION:

The results of this study highlighted that the subcecal was the most frequent anatomical position of vermiform appendix and the postileal position was the most frequent position in inflamed appendix on MDCT in Karachi based population. For preliminary and quick diagnosis our study has provided the gross data on anatomical position wise variation of vermiform appendix and its association with appendicitis which is necessary for appropriate diagnosis and treatment of acute appendicitis.

### Authors Contribution:

**Lubna Faisal:** Substantial direct  
**Rizwan Ajmal:** Substantial intellect  
**Fatima Rehman:** Contribution to the conception  
**Zia ul Islam:** design  
**Sadia Abdul Qayyum:** analysis  
**Saima Athar:** Interpretation of data

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## The Effect of an Educational Intervention on COVID-19 Awareness, Preventive Behaviors, and Risk Perceptions among Secondary School Students

Sadia Ibrar Khan, Mohi Ud Din, Syed Fawad Mashhadi, Shamaila Mohsin, Samreen Misbah, Muhammad Mushtaq Ahmed Khan

### ABSTRACT

**Objectives:** To determine the impact of an educational intervention on secondary school students' Covid-19 awareness and risk perception, as well as their preventive practices.

**Study design and settings:** A quasi-experimental study conducted in private secondary schools.

**Methodology:** The study duration was two months. Students who gave consent and didn't have COVID-19 infection in past were included by non-probability purposive sampling. Raosoft sample size calculator was used to calculate the sample size and it came out to be 385 but a total of 380 students could be enrolled. Among these, 37 responses were invalid making the total sample size to be 343. Ethical approval was taken from the institutional ethical review committee with approval letter number i.e. ERC/ID/126. SPSS version 25 was used for the analysis of data. Frequencies and percentages were calculated. Paired samples T-test was applied to see the difference in participants' scores before and after the intervention. A p-value = 0.05 was taken as significant.

**Results:** The knowledge of students were improved from moderate to high level and the total percentile score from 74.86% to 89.76% after intervention. Their practicing preventive behaviors were at a low level with scores of 69.37%. Their risk perceptions remained at moderate levels and did not see any improvement.

**Conclusion:** Participants practicing preventive behaviors were at a low level. Their knowledge scores improved from moderate to high level after intervention but their risk perceptions remained at moderate levels and no change was seen.

**Keywords:** Awareness, Covid-19, Practices, Prevention.

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### INTRODUCTION:

Residents of Wuhan, China, reported several novel viruses that caused respiratory diseases in people in December 2019. Coronavirus disease 2019 is the title given to the new virus sickness.<sup>1</sup> On 7 January 2020, this virus was identified. It was comparable to the virus that causes the severe acute respiratory syndrome, or SARS. Despite this, the COVID-19 pandemic has evolved into a significant public health hazard, posing a significant challenge to the scientific and medical communities.<sup>2</sup> To prevent the present epidemic, wide-ranging measures are needed to decrease COVID-19 transmission from human to human. Particular attention and effort should be given to preventing or decreasing transmission among very sensitive groups including healthcare workers, youngsters, and elderly people. A society that is made aware about the spread of diseases and how they can be transmitted, as well as the clinical manifestations and the use of safety techniques, seems to be more likely to experience positive perceptions, reducing the virus's dispersion. These arguments rely on two of the popular models in psychology: the health belief model, which supposes that the perception of risk as well as the advantages and barriers linked to diagnostic and intervention tendencies,

ascertain the lifestyle factors embraced, and the other one is planned behavior theory, which emphasizes the value of perceptions toward the behavior in forming an ability to commit that activity.<sup>3</sup> The early mortality of COVID-19 was seen in elderly patients with a weakened immune system, allowing viral infection to spread rapidly.<sup>4</sup> Hand-washing decontaminating chemicals should be readily available at public facilities and establishments. Also, cleaning hands regularly, using a tissue to cover your mouth and nose and discarding used tissues in the detritus; sniffle or coughs into your elbow, not your hands if you don't have a tissue; wearing a mask or face protection in crowded locations; disinfecting surface areas; good ventilation systems; and containment for people who have strong suspicions that they are susceptible are all recommended methods.<sup>5</sup>

The COVID-19 outbreak has spread throughout the globe and has been called the deadliest since 1918-1919 Spanish influenza. By the end of January 2021, COVID-19 was responsible for roughly one hundred million confirmed infections and two million deaths in the world.<sup>6</sup> Governments across the world have decided to close educational institutions in response to the fast spread of COVID-19. According to WHO and public health authorities, closing educational institutions may help flatten the curve of COVID-19 spread.<sup>7</sup> Pakistan's government has decided to close all educational institutions as a precautionary measure to halt the pandemic's fast spread.<sup>8</sup> Although certain nations and regions, including Pakistan, have implemented a wide array of vaccines, the development, and promotion of preventive literature and behavior, in addition to the development of treatment and vaccines, is critical during the 'new normal' period of COVID-19 given its long-term complexity.<sup>9</sup>

In the intellectual, physiological, emotive, interpersonal, and cultural realms, young adulthood as a phase of life, which includes higher education students, correlates to a learning stage and character building. Nevertheless, research shows that students have a high incidence of risky attitudes towards health and have a strong influence on their health.

Furthermore, students usually own special information on basis of their educational experience and, as a result, possess the capacity to impact the health of a community.

Indeed, following the COVID-19 epidemic, a growing number of studies have helped to comprehend our general public preventive behavior in several countries. However, few focused on higher education systems with the bulk concentrating on the effect of knowledge and attitudes on the prediction of the preventive behavior of COVID-19 students. To overcome the limitations of prior research, this study analyses the explicit impacts on COVID-19 prevention actions of secondary school students, attitudes, perceived behavioral control, and perceived risk. While several recent studies of COVID-19 preventative conduct have used educational interventions, it is also important to study the preventive behavior of COVID-19 among students of

secondary schools. Given the aforementioned, the main purpose of current investigations is to evaluate the mediating impact of three elements, i.e. attitudes, preventive practices, and perceived conduct control for students to raise their perception of risk through various forms of health promotion, focusing mainly on individuals having low risk perception.

#### **METHODOLOGY:**

It was a quasi-experimental study conducted in private secondary schools based on educational intervention. The target population of this study was high school students (9<sup>th</sup> and 10<sup>th</sup> class). Ethical approval was taken from the institutional ethical review committee with approval letter number i.e. ERC/ID/126. Prior permission from Principals of the concerned colleges was taken. Written informed consent was taken from the participants prior to data collection. Non-probability purposive sampling was done.

The study duration was two months and inclusion criteria were those students who gave consent; filled out the questionnaire and who didn't have Covid-19 infection in the past while those students who had Covid-19 infection in past six months or did not give consent were excluded. Raosoft sample size calculator was used to calculate the sample size. The required sample size calculated was 385 but a total of 380 students could be enrolled in the study, out of which 37 responses were found to be invalid making the total sample size to be 343.<sup>10</sup> This study was conducted using a self-administered pre-tested modified version of the questionnaire used by Taghrir et al in their study from June 2020.<sup>11</sup> The questionnaire had six sections: Demographics, Pre-Intervention Knowledge, Pre-Intervention Risk Perceptions, Self-Reported Preventive Behaviors, Post-Intervention Knowledge, and Post-Intervention Risk Perceptions. The educational intervention was conducted on two perspectives: Basic Knowledge and Risk Perceptions while self-reported Preventive Practices assessment was done once at the time of data collection. The educational intervention was done by a power point lecture and videos on COVID-19, and finally, re-assessment of Knowledge and Risk Perceptions through a self-administered pre-tested questionnaire was done.

Demographic information included age (in years), gender, and the current class where the student is studying. The level of COVID-19 related knowledge was assessed before and after the intervention using 13 items. For knowledge, the correct answer was assigned 1 point and an incorrect answer or 'I don't know' was assigned 0 points. The total score was calculated and converted into a percentile. A score = 75% was considered as high, 50%-75% as moderate, and =50% as low level of knowledge. Knowledge score was calculated both before and after the educational intervention to establish the effect of the intervention on the study group. To assess preventive behaviors, eight items were used based on the same study. Choices were 'yes' or 'no' and the respondent was assigned one point for each appropriate behavior and

0 points for inappropriate behaviors. The total score ranged from 0 to 8 and was converted to a percentile. Seventy-five percent or higher scores were designated as high performance in preventive behaviors and <75% as low performance. Two items were used to assess the risk perception of COVID-19 among participants. Responses were provided using a 4-point Likert-type scale (1 = not at all, 4 = absolutely yes). The total cumulative score ranged from 2 to 8. Scores between 2 to 3 were designated as low, 4 to 5 as moderate, and 6 to 8 as high-risk perception.

Data was coded and confidentiality was maintained. SPSS version 25 was used for the analysis of this data. Frequencies and percentages were calculated. Paired samples T-test was applied to see the difference in participants' scores before and after the intervention. A p-value = 0.05 was taken as significant.

**RESULTS**

Total participants in the study were 343. Most of them were 16 years old (33.5%) followed by 21.9% of participants of 17 years old. The majority of them were males (62.1%) while most of the study participants were from the 10<sup>th</sup> class (57.4%).

Table 1 shows the level of knowledge of students about

Covid-19 before and after the intervention. Paired samples T-test was applied and significant associations were shown as p-values. The total percentile score before intervention came out to be 74.86% which is indicative that students have a moderate level of knowledge but after the intervention, the total scores percentile was 89.76% which indicates that students' knowledge after educational intervention came out to be of high level. The lowest scores before intervention were about 4 items i.e. about the type of covid-19 infection; about its origin; about the usage of the N-95 mask and its diagnosis by PCR test.

About 8 questions were asked from students to assess their preventive behavior practices. Their percentile score came out to be 69.37% which is below 75% and indicative of low performance as shown in table 2. Risk perception of the two items before intervention were 2.36 + 0.9 and 2.5 + 0.9 respectively amounting to 4.86 + 1.8 (possible range 2 – 8) showing moderate risk perception. Risk perception of these two items after intervention remained at a moderate level with minor changes i.e. 2.33 + 0.85 and 2.51 + 0.9 amounting to 4.84 + 1.75. A significant relationship was found between risk perception scores of before intervention and after the intervention. Risk perception of students before and after intervention is shown in table 3.

Table 1: Covid-19 related knowledge before and after intervention (n = 343)

	Before		After		p-value
	n	%	n	%	
COVID-19 is a respiratory infection caused by a new species of the coronavirus family	198	56.3	271	79	.000
The first case of COVID-19 was diagnosed in Wuhan, China	324	94.5	329	95.9	.208
The origin of COVID-19 is not clear but it seems that it has been transmitted to humans by seafoods, snakes, or bats.	205	59.8	312	91	.000
Its common symptoms are fever, cough, and shortness of breath but nausea and diarrhea were reported rarely	308	89.8	332	96.8	.001
It is transmitted through respiratory droplets such as cough and sneeze.	320	91.3	329	95.9	.007
It is transmitted through close contacts with an infected case (especially in the family, crowded places, and health centers)	299	87.2	320	93.3	.002
The disease can be prevented through handwashing and personal hygiene.	322	93.9	338	98.5	.003
A medical mask is useful to prevent the spread of respiratory droplets during coughing.	316	92.1	335	97.7	.001
The disease can be prevented through no close contact such as handshakes or kissing, not attending meetings, and frequent hand disinfection.	312	89	327	95.3	.018
All people in the society should wear an N-95 mask	68	19.8	213	62.1	.000
COVID-19 can be diagnosed by PCR test.	157	43.8	306	89.2	.000
COVID-19 vaccine is available in the markets	240	70	291	84.8	.291
COVID-19 can be fatal	294	85.7	300	87.5	.056
<b>Total score</b>	<b>74.86</b>		<b>89.76</b>		



Table 2: Practicing preventive behaviors (n = 343)

Practicing preventive behaviors	Yes (%)
I canceled or postponed meetings with friends, eating out and sport events.	212 (61.8)
I reduced the use of public transportation.	246 (71.7)
I went shopping less frequently.	248 (72.3)
I reduced the use of closed spaces, such as a library, theatres, and cinema.	293 (85.4)
I avoided coughing around people as much as possible.	240 (70)
I avoided places where a large number of people are gathered.	185 (53.9)
I increased the frequency of cleaning and disinfecting items that can be easily touched with hands (i.e. door handles and surfaces).	249 (72.6)
I washed my hands more often than usual.	231 (67.3)
<b>Total score</b>	<b>69.37</b>

Table 3: Risk perception of students

Items	I may become infected with COVID-19 more easily than others (%)				p-value	I am afraid to be infected with COVID-19 (%)				p-value
	Not at all	No	Yes	Absolutely Yes		Not at all	No	Yes	Absolutely Yes	
Before	18.4	37.9	32.7	11.1	<b>0.00</b>	21.3	22.7	40.2	15.7	<b>0.00</b>
After intervention	16.3	43.1	31.5	9.0		17.5	26.5	43.4	12.5	

## DISCUSSION:

COVID-19 began in China in late 2019 and quickly expanded globally, causing a domino impact. The disease is causing worry and fear among individuals for a variety of reasons, including the fact that it is new, which implies no one is protected and no vaccine has yet been developed at start of the pandemic.

Most of the items related to knowledge were having high scores except for 4 items i.e. about the type of covid-19 infection and its origin; about the usage of N-95 mask and its diagnosis by PCR test. When asked by participants that “What is covid-19? and is it a respiratory infection?”, more than 3/4<sup>th</sup> of students answered it correctly after intervention whereas only more than half of participants answered it correctly before intervention. The results are similar to a study conducted by Dafni Souli et al where about 3/4<sup>th</sup> of students answered it correctly.<sup>12</sup> When asked about the clinical presentation of Covid-19, more than 90% of students answered it correctly. A study conducted by Yaling Peng et al showed similar results.<sup>13</sup> A study conducted by Lincoln Leehang Lau et al showed that more than 90% of the participants were of the view that mainly disease is transmitted through coughing and sneezing<sup>14</sup> which are similar to the results of our study. Knowledge about hand hygiene and mask use in disease prevention were correct in the majority of participants as shown by the students in a study conducted by Gülsün Ayran et al which are similar to the result of our study.<sup>15</sup>

A study done by Murat Yildirim et al showed that preventive

behaviors were highly practiced by participants and among these practices, increased frequency of handwashing and avoidance of public transport were most common.<sup>16</sup> These results are similar to our study except that most common practicing preventive behaviors were reduced the use of closed spaces; increased frequency of disinfecting items and going shopping less frequently. A study done by Enayat M. Soltan showed that 92% of participants were practicing preventive behaviors.<sup>17</sup> These results are in contrast to our study where 69% of participants practiced it. A study done by Henok Dagne et al showed that about half of participants were practicing preventive behaviors which are in contrast to the results of our study.<sup>18</sup>

A study done by Yani Ding et al showed that students had a high risk perception of Covid-19.<sup>19</sup> A study done by Sherzad Shabu et al showed that participants were having the highest perceived threat level related to Covid-19.<sup>20</sup> These results are in contrast to our study where despite educational intervention, risk perception of students remained at a moderate level. But a study conducted by Tara Ma et al showed that students were having low-risk perception<sup>21</sup> which is similar to the results of our study.

The sample size of the study is good which shows a good representation of students. Also, the benefits of educational intervention are clearly visible in improving students’ awareness about this disease. But, because a self-administered questionnaire was employed, reporting bias could not be ruled out. This study is limited to the students of 9<sup>th</sup> and 10<sup>th</sup> class only, so generalization cannot be done on all school students.

## CONCLUSION:

Participants practicing preventive behaviors were at a low level. Their knowledge scores improved from moderate to high level after intervention but their risk perception remained at a moderate level and no change was seen due to the effect of educational intervention. Because of COVID-19's high disease transmission and opacity, it's critical to raise the perception of risk among students through various forms of health promotion, with special emphasis dedicated to some individuals who have a low and moderate risk perception.

### Authors Contribution:

**Sadia Ibrar Khan:** Conception and design, Collection and assembly of data, Final approval

**Mohi Ud Din:** Conception and design, Analysis and interpretation of the data, Statistical expertise, Final approval

**Syed Fawad Mashhadi:** Drafting of the article, Statistical expertise, Critical revision

**Shamaila Mohsin:** Analysis and interpretation of the data, Critical revision

**Samreen Misbah:** Analysis and interpretation of the data, Statistical expertise

**Muhammad Mushtaq Ahmed Khan:** Introduction, Drafting of the article, Critical revision

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## Association of Resistin with Components of Metabolic Syndrome in Our Local Population

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### ABSTRACT

**Objective:** To investigate the association of resistin with components of metabolic syndrome (MetS) in our local population.

**Study design & setting:** Case-control study, Medical OPD; Lyari General Hospital Karachi (from 15<sup>th</sup> July 2020 till 15<sup>th</sup> December 2020).

**Methodology:** A total of 164 subjects (83 cases & 81 controls) between the age ranges of 35-65 years were selected. Subjects with metabolic syndrome were included in concordance with International Diabetes Federation criteria. Serum resistin levels in both cases and controls were compared. SPSS 20 was used for statistical analysis. Eighty-three patients with metabolic syndrome were enrolled and compared with 81 healthy unmatched controls. Obesity indices, blood pressure, lipid profile, fasting blood sugar, insulin resistance and serum resistin levels were evaluated. Predictive values of resistin for MetS were analyzed using odds ratios.

**Results:** Significantly elevated levels of resistin were found in subjects with metabolic syndrome compared to healthy controls ( $8.23 \pm 4.43$  vs  $6.82 \pm 3.64$  ng/mL,  $p < 0.05$ ). The odds ratio (95% confidence interval) for metabolic syndrome in subjects having higher resistin were: males:  $2.62 [1.11-6.19]$ , females:  $2.81 [1.05-7.49]$ , all  $P_{\text{trend}} < 0.05$ . For individual components of metabolic syndrome, we found the odds ratio to be greatest for hypertension, fasting blood sugar, and insulin resistance; 2.64, 4.83, 2.85, respectively, all  $P_{\text{trend}} < 0.05$ .

**Conclusion:** The present study suggests significant association of resistin with components of metabolic syndrome such as hypertension, fasting blood sugar, and insulin resistance. Compared to healthy controls, subjects with MetS had significantly higher resistin levels. Further research is required to incorporate this biomarker in clinical setting.

**KEYWORDS:** Diabetes Mellitus; Metabolic syndrome; Resistin

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### INTRODUCTION

Metabolic syndrome is defined as a cluster of metabolic risk factors such as high blood pressure, impaired fasting blood glucose levels, increased insulin resistance, high triglyceride levels, decreased healthy cholesterol levels, and increased waist circumference. Moreover, it is a collection of metabolic irregularities that confer upon the individual a high risk of dying due to cardiovascular disease.<sup>1</sup>

According to some experts, increased intra-abdominal fat accumulation or high waist line plays a dominant role in metabolic syndrome in comparison with the other risk factors. Epidemiological studies have shown that Asian people are at a greater risk of developing type 2 diabetes and early cardiovascular events compared to Europeans, therefore a lower cutoff values have been set for the classification of body mass index and waist circumference for Asians by World Health Organization. Several studies have demonstrated that obesity being a chronic inflammatory disorder forms a link between insulin resistance and MetS. With the rise in incidence of obesity, the risk of acquiring MetS and dying of heart disease increases manifold.

Adipokines released from the adipose tissue may provide the missing link for the development of MetS. Identifying these biomarkers may enable early detection and intervention of cardiovascular disease (CVD) and its complications.<sup>2</sup>

Resistin is a small protein molecule secreted by the macrophages and adipose tissues. It promotes inflammation by inducing various proinflammatory makers such as tumor necrosis factor alpha and interleukins. Anecdotal evidences have suggested that resistin is not only associated with the development of obesity and diabetes, but it does have a profound impact in the emergence of cardiovascular diseases, hypertension and atherosclerosis<sup>3</sup>.

Resistin, produced by macrophages in humans, has been observed to inhibit the peripheral actions of insulin, increasing insulin resistance. Many adipokines work towards maintenance of energy balance. However, human resistin and recently identified resistin like molecules (RELM) are found to act as antagonist to insulin, contributing to insulin resistance and MetS.<sup>4</sup>

Resistin is considered as an important adipocytokine which lowers the insulin sensitivity and increases insulin resistance and inflammation leading to type 2 diabetes. Obesity, a comorbid in diabetes causes a dysfunction in adipose tissue, leading to disruption of adipocytokine release<sup>5</sup>.

A similar study conducted by Yousaf et al, studied the effect of visceral obesity on insulin resistance and observed that thiazolidinediones increased insulin sensitivity while decreasing resistin levels. Moreover, he concluded that increased serum resistin levels indicated insulin resistance and impending increased blood sugar levels<sup>6</sup>. Animal studies have shown that thiazolidinediones, drugs given to reduce insulin resistance in type 2 diabetes, reduce resistin levels<sup>7</sup>.

Increased incidence of cardiovascular diseases among the South Asians as a consequence of central obesity has been hypothesized by various epidemiological researches. Central obesity is a primary risk factor for metabolic syndrome which alters the relationship between adipokines and metabolic syndrome and leading to metabolic and cardiovascular disorders. Visceral obesity poses a major risk to adipose tissue dysfunction which further leads to the development of other risk factors of Metabolic syndrome such as hypertension, impaired insulin sensitivity, atherogenesis, and dyslipidemia. Moreover, obesity is the key source of resistin secretion by the adipose tissue which plays an important role in the pathogenesis of insulin resistance. Several antidiabetic drugs have been proposed that decrease the serum resistin levels and improve the lipid profile to restore insulin sensitivity to normal in insulin resistant humans<sup>8,9,10</sup>.

With the rise in incidence of obesity in our local population, the risk of acquiring metabolic syndrome and dying of heart disease increases manifold. Adipokines released from the adipose tissue may provide the missing link for the

development of metabolic syndrome. Identifying these biomarkers may enable early detection and intervention of cardiovascular disease (CVD) and its complications. In this study, we explored the association of adipokine resistin with components of Metabolic syndrome in our local population.

## METHODOLOGY

This case-control study was conducted at Lyari General Hospital and a total of 164 subjects (83 cases & 81 controls), both males (46) & females (34) were selected from 15<sup>th</sup> July 2020 till 15<sup>th</sup> December 2020. Eighty three participants, aged 35-65 years, with Metabolic syndrome were selected from Medical OPD of Lyari General Hospital. Metabolic syndrome was diagnosed based upon criteria proposed by new International Diabetes Federation (IDF)<sup>11</sup>. This requires absolute presence of central obesity plus increase in any two of the following: triglycerides, cholesterol, blood pressure, fasting blood sugar.<sup>11</sup>

Exclusion criteria included those with active infection, end stage systemic disease, malignancy, pregnancy and lactation.

Healthy controls included subjects between ages of 35-65 years, both genders (males (46) & females (34) with no history of metabolic syndrome and were taken from the general population (n = 81). Written informed consent was taken from the subjects and approval was given by the Research Ethics committee of Shaheed Mohtarma Benazir Bhutto Medical College, Lyari (ERC)/2020-21/0301). Sample size was calculated using the open epi sample size calculator; CI-95%, Power: 80%, OR: 2.2<sup>12</sup>, N=164.

All subjects were evaluated for the components of metabolic syndrome. Waist circumference measured to the nearest 0.1cm was taken at the midpoint between iliac crest and lower border of rib cage. Blood pressure was measured by mercury sphygmomanometer in the sitting position and a mean of three measurements was recorded. Fasting venous blood samples were collected to measure glucose, glycated hemoglobin, lipid profile, insulin, and resistin levels.

ELISA kits were used to measure the insulin and resistin levels with a sensitivity to detect lowest concentration at 1.76  $\mu$ IU/mL for insulin and 0.03 ng/mL for resistin. Insulin resistance was measured by Homeostatic Model Assessment for Insulin Resistance (HOMA-IR). The 75th percentile for resistin in healthy controls was taken as the cutoff points above which the levels were considered as high.

Data was analyzed using SPSS version 20. Descriptive statistics were presented as mean  $\pm$  standard deviation (SD). Shapiro-Wilk test was done to test for normality of distribution. Student t-test was used to compare means. Chi-square test was applied to analyze the strength of association. Statistical significance was considered at  $p < 0.05$ .

## RESULTS:

Of the total 164 participants (83 cases and 81 controls), 90(54.8%) were males and 74(45.1%) were females. The



mean age was 50.15±9.36 years (range 35–65 years). We observed significant difference in all anthropometric measurements and biochemical parameters between subjects with metabolic syndrome and healthy controls (Table 1). Compared to healthy controls, subjects with metabolic syndrome had significantly higher resistin levels (p<0.05).

The 75th percentile for resistin in control subjects was taken as the cutoff point above which the levels were considered as high. The cutoff level (ng/mL) in males and females were 7.30 and 7.27, respectively. Univariate regression analysis

showed that subjects having higher resistin levels were more than twice as likely to develop metabolic syndrome (Table 2).

Table 3 shows OR between individual components of MetS and the adipokine studied. As the number of components of MetS increased, the odds of having the disease also increased. Subjects with higher levels of resistin were more likely to have central obesity and higher levels of blood pressure, fasting blood glucose and dyslipidemia.

**DISCUSSION:**

In the present study, significant association was found between resistin and components of metabolic syndrome such as central obesity, hypertension, hyperglycemia, increased insulin resistance and impaired lipid profile. Abdominal obesity is a growing epidemic worldwide and has a strong relationship with insulin resistance and Metabolic syndrome.<sup>12</sup>

Results of our study showed significant difference in all anthropometric measurements and biochemical parameters between subjects with Metabolic syndrome and healthy controls. Also significantly increased levels of resistin were found in patients with Metabolic syndrome compared to healthy controls (8.23±4.43 vs 6.82±3.64 ng/mL, p<0.05). This was in concordance with the systemic review and meta-analysis conducted by Su KZ et al who found a significant relationship (P=0.003) between circulating resistin levels and insulin resistance in patients with type 2 diabetes mellitus and obesity<sup>13</sup>. A similar study was conducted by Zahary MN et al in Malaysia. His results showed serum resistin levels to be significantly higher in subjects with metabolic syndrome (11.22 ± 6.34 ng/ml; P = 0.002) compared to non-MetS subjects. After investigating, the significant relationship of resistin with metabolic syndrome criteria, he indicated that resistin can be used as a potential biomarker for the diagnosis of metabolic syndrome<sup>14</sup>.

For individual components of MetS in cases (83), we found the odds ratio for hypertension, fasting blood sugar, and insulin resistance as 2.64, 4.83, 2.85, respectively, all P<0.05.

In our study, significant association of resistin was found with hypertension (P=0.02). This was consistent with the study conducted by Mostafa zadeh et al. He reviewed the effect of resistin and its contribution in the initiation and progression of metabolic syndrome and included both consistent and inconsistent studies regarding relationship of resistin with fasting blood glucose, triglycerides, high density lipoprotein and central obesity. Data obtained from recent experimental and clinical studies revealed significantly higher levels of resistin (12±4vs6.8±3.6) in hypertensive individuals when compared with normotensive individuals (P<.01).

Several mechanisms by which resistin affects blood pressure have been proposed which include its vasoconstriction

Table 1: Descriptive Measures of Study Population

	Controls (n = 81)	MetS (n = 83)	P
Age (y)	49.12±2.52	52.35±3.30	0.06
Anthropometric Indices of Obesity			
Body Mass Index (kg/m <sup>2</sup> )	24.97±4.16	28.60±4.34	<0.001
Waist Circumference (cm)	84.63±2.17	92.81±4.36	<0.001
Hip Circumference (cm)	100.31±8.20	105.49±10.01	0.004
Percent Body Fat (%)	30.11±5.24	34.81±4.80	<0.001
Clinical Examination			
Systolic BP (mmHg)	127.85±15.29	144.18±20.60	<0.001
Diastolic BP (mmHg)	80.02±9.37	84.77±10.75	0.003
Biochemical			
HDL-Cholesterol (mg/dL)	43.65±4.12	42.61±4.64	0.131
Triglyceride (mg/dL)	137.99±58.48	159.06±61.67	0.026
Fasting Blood Glucose (mg/dL)	100.34±5.12	150.36±5.69	0.002
HbA1c (%)	4.35±1.02	7.35±1.71	<0.001
Insulin (µIU/mL)	5.54±6.02	9.99±9.47	<0.001
HOMA	1.74±2.12	3.67±3.46	<0.001
Resistin (ng/mL)	6.82±3.64	8.23±4.43	0.02

Abbreviations: BP, blood pressure; HDL, high-density lipoprotein; HOMA, homeostasis model assessment of insulin resistance. Note: Unpaired student's t test was used to compare means between control group and MetS group. Values expressed as mean±SD, significance level taken as p<0.05

Table 2: Odds Ratio Between Resistin Levels and Metabolic Syndrome

	Males (44)			Females( 40)		
	OR	[95% CI]	p	OR	[95% CI]	p
Resistin	2.62	[1.11–6.19]	0.027	2.81	[1.05–7.49]	0.038

Abbreviations: OR, odds ratio; CI, confidence interval. Note: Significance level taken as p<0.05

Table 3: Odds Ratio Between Resistin & Risk factors of Metabolic Syndrome

	OR	[95% CI]	p
Hypertension	2.64	[1.11–6.28]	0.027
WC	1.68	[0.72–3.92]	0.021
Triglyceride	2.08	[0.81–5.32]	0.022
HDL-C	1.89	[0.74–4.79]	0.180
FBS	4.83	[1.72–13.53]	0.002
HOMA-IR	2.85	[1.17–6.89]	0.020

Abbreviations: WC, waist circumference; HDL-C, high density lipoprotein cholesterol; FBG, fasting blood glucose; HOMA-IR, homeostatic model assessment of insulin resistance; OR, odds ratio; CI, confidence interval. Note: Significance level taken as p<0.05

property, proliferation of smooth muscle cells and upregulation of angiotensinogen expression in the liver and thus activating the renin-angiotensin system (RAS) Activation of RAS leads to the elevation of blood pressure.<sup>15,16,17</sup> The vasoconstrictor property of resistin has also been supported by Niaz S et al study. He reported that resistin is released from white blood cells and plays an important role in inflammation leading to endothelial dysfunction, inhibiting the release of vasodilator NO from endothelium, while promoting the release of vasoconstrictor endothelin-1<sup>18</sup>.

Our study results showed significant association between resistin and triglycerides (OR: 2.08; CI (95%) [0.81–5.32]; P=0.022). This was in favor with the study conducted by Niu et al.<sup>19</sup>

His study results suggested that increased serum resistin contributes to a higher risk of dyslipidemia (P<.05). Anthropometric measurements including waist circumference was associated with resistin levels in this study (OR: 1.68 [0.72–3.92]; CI (95%); P=0.02).

Study conducted by Farah revealed a significant relationship (P<0.01) between resistin and anthropometric parameters (waist circumference, hip circumference, waist-hip ratio and body mass index) in young obese adults<sup>20</sup>. Wijetunge also found a significant association between resistin and waist circumference (P<0.05). Immunohistochemistry of adipose tissue showed increased expression of resistin in adipocytes of subcutaneous adipose tissue compared to visceral adipose tissue (P<.05).<sup>21</sup>.

Inconsistent studies by Asgary S, Chen CC & Kielstein JT mentioned in the systematic review by Mostafazadeh et al, observed that serum levels of resistin were not correlated with waist circumference and body mass index<sup>15</sup>.

Increased association of resistin with impaired fasting blood sugar (OR:4.83[1.72–13.53];P=0.002)and insulin resistance (OR:2.85[1.17–6.89];P=0.020) was found in our study which was in concordance with the study conducted by Bilgetekin et al & Wijetunge et al (P<0.001). In their study, they identified resistin as an important biomarker linked to central obesity and insulin resistance in subjects with impaired fasting blood glucose levels<sup>21,22</sup>.

In our study, odds ratio between resistin levels and metabolic syndrome was found to higher in women compared to men. The odds ratio (95% confidence interval) for MetS in subjects having higher resistin were females: 2.81[1.05–7.49] compared to males: 2.62[1.11–6.19], all P<0.05. This was consistent with the study conducted by Qi et al. His data suggested that subjects in higher resistin quartiles were more likely to be women with metabolic syndrome<sup>23</sup>(P<.001).

Marcelino-Rodríguez et al showed insignificant association (OR: 0.76-3.83) between resistin and HDL-C<sup>24</sup>. This was in relation to our study which showed non-significant association of resistin with high density lipoprotein cholesterol (OR: 0.74–4.79; P=0.180).

There were some limitations to our study. Results from a case control design having small sample size may not be applicable to the whole population due to high prevalence of MetS in Pakistan. Second, the cutoff value of WC, the primary criteria for diagnosing MetS, has not been defined for our population that may have affected the results. However, the highly significant relationship observed in our study between resistin and MetS cannot be totally ignored. Finally, investigating genetic factors may further explain variations in adipokine levels.

## CONCLUSION

It is concluded that there is a strong association of resistin with waist circumference, increased blood pressure, elevated fasting blood sugar levels and impaired lipid profile. Thus, resistin can be used as a biomarker for the diagnosis of metabolic syndrome in clinical settings. Future recommendations for additional research are needed to recognize the receptors used by resistin in order detecting the signaling pathways. This will help in clarifying the role of resistin in the pathogenesis of MetS.

### Authors Contribution:

**Mozaffer Rahim Hingorjo:** Revising it critically for important intellectual content.

**Muhammad Noman Rashid:** Conceived, designed and writeup.

**Naila Parveen:** Drafting the article and compilation of results

**Lubna Riaz:** Data collection and Literature search.

**Riaz Ahmed Shahid:** Designed and editing

**Zainab Hasan:** Data entry SPSS & Statistical analysis

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## Efficacy of Prophylactic Phenylephrine in Prevention of Hypotension in Parturient Undergoing Spinal Caesarean Section

Muhammad Salman Maqbool

### ABSTRACT:

#### OBJECTIVE:

To determine the hemodynamic (pulse, blood pressure) stability of prophylactic bolus dose of phenylephrine in caesarean section under spinal anaesthesia.

**Study design & Setting:** Interventional study was done from 13<sup>th</sup> Feb 2021 to 07<sup>th</sup> Oct 2021 at Islam Teaching Hospital, Sialkot.

**Methodology:** Study approval was taken vide letter no.2021-05/AN dated 26-3-2021, issued by Chairman Ethical Review Board, Islam Medical College, Sialkot. Statistical software(version.3.1.9.2) with (prob of 0.80, critical  $\alpha^2$  value 15.08), was employed and sample size calculated to be 200 cases i.e. groups-I (injection phenylephrine 100 $\mu$ gm) and group-II (placebo) divided by lottery method into 100 each given at spinal neuraxial block. Primary study variable being heart rate and blood pressure variations. Spearman's Rank correlation statistical test was used to check interdependence between the two variables i.e., systolic blood pressure and pulse rate. SPSS version 21 was used.

**Results:** In group-II, in 36% cases atropine was given as compared to 24% cases in group-I, thus 150 % more anti-cholinergic was used in group-II. In group-II, in 33% cases top-up of injection Adrenaline 10 microgram was used whereas given in 24% cases in group-I, thus 137.5 % more top-ups of vasopressors in group-II. In group-I, heart rate decreased by value of 9.02 % with respect to baseline value, while comparable reading noted was 3.42% decline in pulse rate in group-II respectively.

**Conclusion:** Prophylactic phenylephrine at time of spinal injection resulted in stable blood pressure and pulse rate values in caesarean spinal delivery.

**Keywords:**Caesarean delivery, Hypotension, Phenylephrine, Spinal anaesthesia.

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### INTRODUCTION:

In caesarean section, spinal anaesthesia is the anesthesia of choice for elective surgery<sup>1</sup>. The intra-thecal block has several advantages, as avoidance for the need of airway control (difficult intubation), lower risk of aspiration pneumonia (full stomach), providing dense and effective block which is easy to place and economical as well, but may be associated with complications such as hypotension, bradycardia<sup>1</sup> etc. Among the various factors implicated in sign and symptoms of hypotension e.g. sudden apprehension, sinking of heart, nausea and altered mental status with neuraxial block, the aorto-caval compression is independent of spinal anesthesia it can aggravate the effects of spinal anesthesia due to gravid uterus particularly in supine posture. The physiologic

compensatory response in parturient is the reflex increase in peripheral sympathetic vasomotor tone which help parturient to maintain adequate arterial systolic blood pressure despite high cardiac output, the sympathetic block following spinal or general anaesthesia is additional factor impairing the protective reflex, whereas main aim after sympathetic block is maintenance of mean pulse and blood pressure (for adequate placental perfusion)<sup>2</sup>, to counter-act foetal acidosis.

For this purpose, many measures have been proposed such as use of crystalloids and/or colloids<sup>3</sup> with no particular beneficial effect with use of either colloid solution (haemaccel, gelatin solutions, hetastarch) in comparison to crystalloid solutions (0.9% isotonic saline, ringer lactate), the intra-venous fluids either given as preload(given commonly in dose of 10-15ml/kg body weight, 20 minutes prior to placing spinal block ) vs co-load<sup>4</sup>(intra-venous fluids pushed at time of spinal block when vasodilatory effect is taking place), speed of injection<sup>5,6</sup>, wedge placement under right hip<sup>7</sup>, use of vasopressors agents via infusion or in bolus form<sup>8</sup> etc to stabilize blood pressure and heart rate following spinal block. Eskandr Ashraf M and colleagues did double

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blind randomized controlled research on vasopressors to prevent hypotension in parturient following neuraxial anaesthesia given in infusion form and noted that norepinephrine and phenylephrine provided better hemodynamic stability and foetal well-being than ephedrine<sup>8</sup>.

Over the years ephedrine (with sympathomimetic agonist effect at  $\alpha$  and  $\beta$  adrenergic receptors) has been considered as a drug of choice for immediate management of hypotension following intra-theatal block with a longer time period of action after intravenous bolus dose in comparison to other vasopressor agents<sup>9</sup>. In another study on effects of norepinephrine (with weaker beta and higher alpha adrenergic agonist receptor effect) given as infusion titrated to maintain blood pressure within 20% of initial value at time of sub-arachnoid block showed promising results in managing post-spinal hypotension<sup>10</sup>.

Lately phenylephrine<sup>11</sup>, alpha-I receptor agonist has been considered vasopressor agent of choice particularly in caesarean section as it is associated with better umbilical arterial blood gas analysis values (low acidosis and base excess values of umbilical vessels) as it does not cross placental barrier. Other vasopressors used include metaraminol and mephentermine with alpha and beta receptor agonist effect with disadvantage of tachyphylaxis. American Society of Anesthesiologist Obstetric Anesthesia Task force advocated that both phenylephrine and ephedrine can be used with better foetal well-being with later agent, similar inference was done in Canadian anaesthesia guidelines<sup>11</sup>. Considering above stated facts we working at a peripheral area teaching unit designed study to assess phenylephrine in terms of hemodynamic stability (pulse and blood pressure) effect administered prophylactically at time of spinal block in elective caesarean section cases.

#### METHODOLOGY:

This interventional (randomized controlled) study with purposive sampling technique was under taken at Islam Teaching Hospital (main obstetric operation room). Study approval was taken vide letter no.2021-05/AN dated 26-3-2021, issued by Chairman, Ethical Review Board, Islam Medical & Dental College, Sialkot. Statistical software (version.3.1.9.2) was utilized for sample size calculation and came out to be 200 cases with (1- $\beta$  err prob of 0.80, critical  $\chi^2$  value 15.08), parturient planned for elective caesarean section under intra-theatal block placed by employing lottery method into 2 prophylactic treatment groups of 100 each, group-I (Injection phenylephrine 100 $\mu$ gm) and group-II (placebo) with degree of freedom value of 5. The time duration of study was approximately 8 months i.e., from 13<sup>th</sup> Feb 2021 to 07<sup>th</sup> Oct 2021. The inclusion criteria being American Society of Anesthesiologist<sup>12</sup> medically fit parturient, elective caesarean section, age between 18-40 years<sup>5</sup>. The exclusion criteria being parturient with coagulopathy, stenotic valvular heart

diseases, eclampsia, emergency caesarean section<sup>5</sup>. Standard pre-anaesthesia evaluation was done based on printed questionnaire proforma with pre-medication ordered as per American Society of Anesthesiologist<sup>12</sup> guidelines and informed written consent was taken. All parturient had co-loading of crystalloids via large bore intravenous lines. Monitoring (electrocardiograph, pulse oximetry, blood pressure, heart rate) was attached and baseline values noted. Sub-arachnoid block was placed using aseptic technique at L3-4 level with 25g quincke spinal needle (hyperbaric 0.75%) 1.5ml was given and T<sub>6</sub> sensory level was ascertained prior to start of procedure. Parturient received prophylactic medication according to groups at time of spinal block. The vials were diluted to 4ml solution and given by anaesthetic nurse provided in labelled sealed envelopes at time of spinal injection. The consultant anaesthetist performing block was having no knowledge about type of medication given, being prepared by colleague anaesthetist and both were part of team. Parturient were blinded to grouping. Hemodynamic stability (heart rate, blood pressure both systolic and diastolic) was noted from baseline value till initial 15 minutes at 2-minute interval following spinal block. The primary study variable being heart rate and blood pressure (systolic and diastolic) variations, whereas subordinate variable studied were; number/percentage of hypotension i.e., mean / standard deviation, bradycardia manifestation (number/percentage of cases in which atropine was administered), the use of colloids and associated complications. Hypotension was labelled in study as a decrease of 15% in systolic blood pressure from baseline or (<100mmHg) and bradycardia categorised by 20-25% decrease from baseline value. Heart rate and blood pressure variations were all correlated in relation to baseline readings. Spearman's Rank correlation was used to check interdependence between the two variables i.e., systolic blood pressure and pulse rate of both groups. Patient confidentiality was kept in check during study. The correlation is significant at the 0.01 level. SPSS version 21 was used.

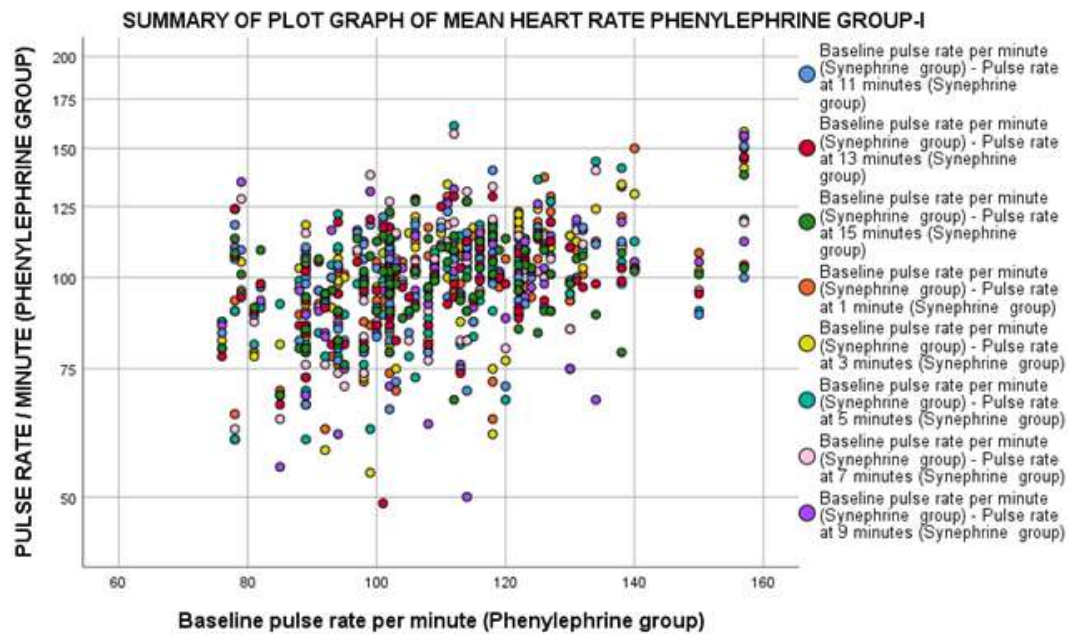
#### RESULTS:

Hemodynamic data of both groups (blood pressure systolic and diastolic in mmHg) is shown in table-1. The age (years) statistics in group-I (phenylephrine) being mean 26.73 (SD of 3.55) with minimum and maximum being 19 and 40 years, whereas in group-II (placebo) the mean age was 26.81 (SD of 3.41) with minimum and maximum values of 20 and 38 years respectively. The mean heart rate baseline value and the relative change which occurs at interval of 1,3,5,7,8,11,13 and 15 minutes after placement of sub-arachnoid block in baseline value in group-I (phenylephrine) and group-II (placebo) are presented in graph 1 and 2 respectively. In group-I, in 15 cases (15%) both adrenaline and phenylephrine were given for optimization of post-spinal hypotension whereas in group-2 in 9 cases (9%) both agents were administered respectively. Detailed vasopressor

Table-1: Group-I &amp; II statistics (n=200)

		Group-I(Phenylephrine)	Group-II(Placebo)
Systolic blood pressure (SBP) & Diastolic blood pressure (DBP) in (mmHg) baseline	Mean	131.85 / 81.86	135.47 / 87.79
	Standard Deviation	16.02 / 12.49	19.06 / 14.83
	Minimum	67 / 37	96 / 45
	Maximum	168 / 114	200 / 127
SBP & DBP at 1 minute	Mean	127.96 / 77.40	132.69 / 83.05
	Standard Deviation	16.40 / 14.21	20.11 / 16.40
	Minimum	78 / 42	64 / 26
	Maximum	166 / 109	192 / 127
	Percent decrease to baseline value	2.95% / 5.27%	2.05% / 5.39%
	P-value	.002 / .005	.000 / .001
SBP & DBP at 3 minutes	Mean	120.28 / 70.18	126 / 76.47
	Standard Deviation	19.14 / 16.10	21.67 / 17.62
	Minimum	71 / 34	65 / 34
	Maximum	171 / 96	175 / 119
	Percent decrease in reference to baseline value	8.8% / 14.26%	7% / 12.89%
	P-value	.012 / .691	.385 / .632
SBP & DBP at 5 minutes	Mean	117.95 / 66.40	122 / 73.51
	Standard Deviation	18.24 / 16.94	21.66 / 19.27
	Minimum	74 / 28	53 / 23
	Maximum	175 / 126	166 / 115
	Percent decrease in reference to baseline value	10.5% / 18.8%	9.9% / 16.26%
	P-value	.598 / .148	.506 / .591
SBP & DBP at 7 minutes	Mean	112.85 / 60.64	120.73 / 71.20
	Standard Deviation	18.49 / 16.41	20.94 / 19.07
	Minimum	61 / 26	55 / 22
	Maximum	161 / 113	171 / 110
	Percent decrease to baseline value	14.4% / 25.92%	10.9% / 18.89%
	P-value	.282 / .094	.055 / .076
SBP & DBP at 9 minutes	Mean	112.65 / 62.16	120.59 / 71.86
	Standard Deviation	17.82 / 15.69	20.70 / 18.23
	Minimum	72 / 32	61 / 25
	Maximum	157 / 106	174 / 130
	Percent decrease to baseline value	14.6% / 24.06%	11% / 18.14%
	P-value	.006 / .126	.009 / .187
SBP & DBP at 11 min.	Mean	114.73 / 62.45	118.20 / 70.36
	Standard Deviation	17.59 / 16.40	18.13 / 15.95
	Minimum	80 / 30	72 / 31
	Maximum	188 / 124	162 / 106
	Percent decrease to baseline value	12.98% / 23.46%	12.74% / 19.85%
	P-value	.029 / .027	.122 / .395
SBP & DBP at 13 min.	Mean	113.39 / 62.08	117.58 / 68.86
	Standard Deviation	17.70 / 16.61	15.88 / 14.64
	Minimum	62 / 26	75 / 34
	Maximum	177 / 115	164 / 100
	Percent decrease in reference to baseline value	14% / 24.2%	13.20% / 21.56%
	P-value	0.018 / .048	.081 / .615
SBP & DBP at 15 min.	Mean	114.30 / 62.05	118.40 / 68.38
	Standard Deviation	16.66 / 15.84	15.96 / 15.15
	Minimum	79 / 31	78 / 37
	Maximum	164 / 112	168 / 100
	Percent decrease in reference to baseline value	13.31% / 24.19%	12.60% / 22.10%
	P-value	.356 / .038	.430 / .121

Graph-1: Mean heart rate at time intervals group-I



Graph-2: Mean heart rate at time intervals group-II

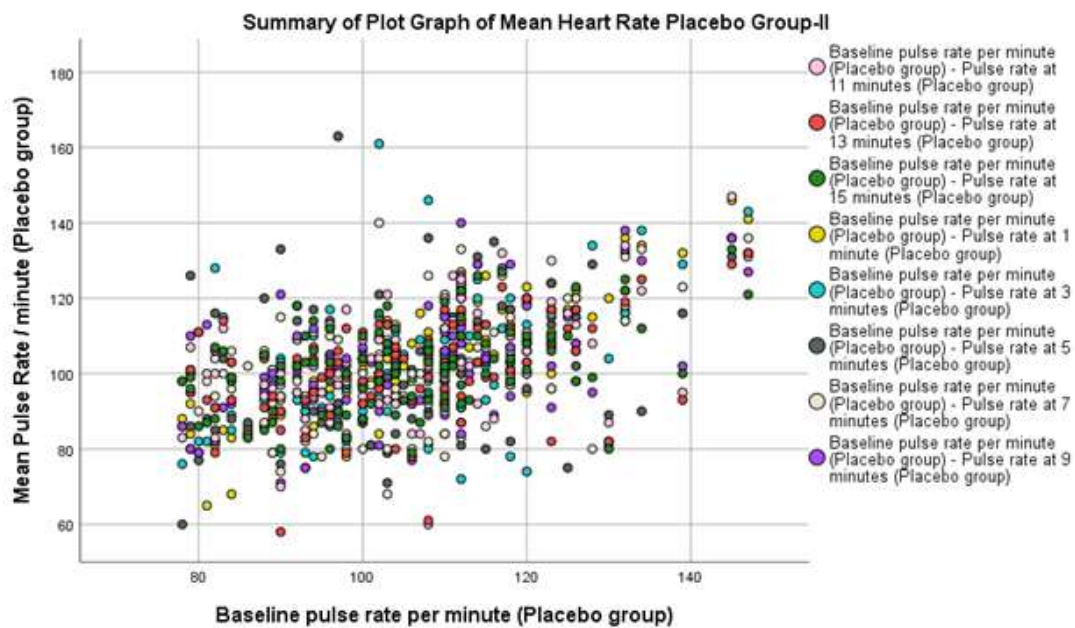


Table-2: Vasopressor / Anticholinergic consumption(n=200)

		Group-I	Group-II
		Number	Percent
Injection. Phenylephrine (100µgm)	Used	40 / 40%	33 / 33%
	Not given	60 / 60%	67 / 67%
Injection. Adrenaline (10µgm)	Used	24 / 24%	33 / 33%
	Not used	76 / 76%	67 / 67%
Injection. Atropine(0.5mg)	Used	24 / 24%	36 / 36%
	Not used	76 / 76%	64 / 64%

Table-3: Spearman's Rank correlation.

		SBP at 15 minutes in mmHg (Placebo group-II)	Pulse rate at 15 minutes (Phenylephrine group-I)	Pulse rate at 15 minutes (Placebo group-II)	SBP at 15 minutes in mmHg (Phenylephrine group-I)
Systolic blood pressure at 15 minutes in mmHg (Placebo group-II)	Pearson Correlation	1	.264**	.052	.148
	Sig. (2-tailed)		.008	.606	.143
	N	100	100	100	100
Pulse rate at 15 minutes (Phenylephrine group-I)	Pearson Correlation	.264**	1	-.035	.231*
	Sig. (2-tailed)	.008		.729	.021
	N	100	100	100	100
Pulse rate at 15 minutes (Placebo group-II)	Pearson Correlation	.052	-.035	1	-.154
	Sig. (2-tailed)	.606	.729		.126
	N	100	100	100	100
Systolic blood pressure at 15 minutes in mmHg (Phenylephrine group-I)	Pearson Correlation	.148	.231	-.154	1
	Sig. (2-tailed)	.143	.021	.126	
	N	100	100	100	100

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

\* . Correlation is significant at the 0.05 level (2-tailed).

and atropine used in both groups of study are depicted in table-2. Spearman's Rank correlation between the two variables i.e., systolic blood pressure and pulse rate of both groups is shown in table-3 and is significant at the 0.01 level.

#### DISCUSSION:

In group-II (placebo) in 36(%) cases atropine was given as compared to 24% cases in group-I (phenylephrine) thus 150 % more anti-cholinergic was used in group-II. In another study<sup>13</sup> atropine given initially due to bradycardia depicts as initial cautionary symptom following intra-theal block, which results in elevated systolic blood pressure apart from increase in heart rate. Similarly in group-II (placebo) in 33% cases top-up of injection adrenaline 10 microgram was used whereas given in only 24% cases in group-I, thus 137.5 % more top-ups of vasopressors needed in group-II. In group-I (phenylephrine) heart rate decreased by value of 9.02 % with respect to baseline value, while comparable reading noted was 3.42% decline in pulse rate in group-II (placebo) respectively, as lower value can be attributed to additional administration of atropine as stated above. In study in 2 cases (1%) colloid (Heamacel) was given along with left table tilt, in 2 cases (1%) bradycardia with pauses was noted, settled with anti-cholinergic administration. Pre-mature ventricular contractions and post-partum hemorrhage requiring B-lynch suturing was noted in 1 case (0.5%) respectively. In group-I (phenylephrine) systolic and diastolic blood pressure (mmHg) decreased by value of 15.34% and 31.92% with respect to baseline value, while comparable reading were 12.60% and 22.10% respectively in group-II (placebo). Though the systolic blood pressure fall was not statistically significant and in study as per standard taken of was 15% decline from baseline value the group-II value was within desired limits and group-I was insignificantly

just over stated value. In another study it was stated that due to lack of consensus classification on allowable hypotension (systolic blood pressure) following sub-arachnoid block in parturient which is up to 20% decrease in majority of case studies and in our study as well was within 20% value mark<sup>14</sup>. In another study vasopressors infusion was utilized to counter act sympathetic block hypotension rather than prophylactic employing bolus dosage<sup>15,16,17</sup>(regimen used in our study) and in another study infusion of phenylephrine was found to be less effective<sup>18</sup>. In another study the wide-ranging variables implicated in maternal hypotension seen following sympathetic block, were evaluated related to (anaesthesia practices as well as to parturient), they were identified as important ones<sup>19,20</sup>. In a review study done on current vasopressor given for hypotension in spinal caesarean delivery with phenylephrine the reflexive lowering of heart rate being main concern, researchers have looked for various alternatives like nor-epinephrine, ephedrine etc though evidence still favours it's use<sup>21</sup> regimen used in our study. In another review article suggested a multi-modal approach to address post spinal lowering of blood pressure which should be cost effective and development of simple protocol to follow<sup>22</sup>.

As under anaesthesia a reduction in sympathetic tone occurs which causes hypotension, a study was done which concluded that at induction time intra-venous dose of 100microgm phenylephrine was effective to counter act hypotensive effect even during general anaesthesia, similar protective stability effect of phenylephrine on systolic and diastolic blood pressure(cardiac output) was observed in spinal anaesthesia induced hypotension in parturient with no systemic diseases<sup>23</sup>, similar study results were noted in our study as well. In another study, it was inferred that in caesarean spinal delivery cases phenylephrine infusion was compared to its bolus administration to prevent sympathetic block hypotension and was noted to be more effective<sup>24</sup>.



However, another study failed to demonstrate any clinical beneficial effect of variable rate or fixed rate of phenylephrine infusion in prevention of spinal block hypotension and with bolus dose regimen of phenylephrine less dose is required and maintains stable post-spinal blood pressure<sup>11</sup>. The result in our study also showed favourable effect of prophylactic bolus dose of phenylephrine on blood pressure in the initial 15 minutes following spinal block. In Study done by Maqbool MS and colleagues<sup>25</sup> phenylephrine in dose of 100microgm was administered to counter spinal induced hypotension effectively, same dose regimen was adopted in our study also.

Limitations of our study, was that no measurement was done of speed of spinal injection<sup>5,6</sup>, and also of timing (spinal injection till start of procedure), emergency caesarean section were not included and further research is warranted as to foresee efficacy of drug with only alpha agonist or a drug combination in control of spinal block hypotension.

### CONCLUSION:

In the study prophylactic bolus administration of phenylephrine at time of spinal injection resulted in stable blood pressure and pulse rate values in caesarean section under spinal anaesthesia

#### Authors Contribution:

Muhammad Salman Maqbool: Concept & Design of Study, Drafting, Revisiting Critically, Data Analysis, Final Approval of version.

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## Are Patients Satisfied with Healthcare Services in Hospitals? Which Dimensions Influence it?

Neelam Jawed Qureshi, Inayat H. Thaver, Omer Shahid, Manahil Khalid, Zuhaib Arshad, Munza Yusuf, Mashal Sarwar, Hafiz Hussain, Wara Fatima

### ABSTRACT:

**Objectives:** To determine the patient satisfaction with health care services provided in hospitals, disregard of whether private or public

**Methodology:** A cross-sectional online survey was conducted from January to October 2020 who had utilized health services from private or public hospitals. A questionnaire was used for assessing the satisfaction in various dimensions; Likert scales were used for quantifying the level of satisfaction. A formal approval of ERC from the parent institution and informed consent was sought. The sample size was 384 keeping the expected satisfaction at 50%; non-probability sampling was done. Multiple variables were used to assess patient satisfaction. They were grouped into four thematic areas, and a mean score was given to each.

**Results:** The mean age of participants was  $25.19 \pm 6.99$ . More than half of the participants (59.9%) visited a private hospital compared to only 27% visiting a government hospital. Overall, 257 (88.9%) participants were satisfied with their previous visit. The satisfaction levels varied with various dimensions; with quality of doctor 73.2%; the environment and basic facilities 76.8%; the process of seeking care - 57.4%; and with medicine and diagnostic facilities 67.4%.

**Conclusion:** Three-quarters of the study population were satisfied with their last hospital visit. The perceived quality of doctors, the ambience and hospitals' general facilities make a difference in patients' satisfaction. The follow-up visits and compliance with the treatment are influenced by how satisfied one is with the last visit.

**Keywords:** Patient's Satisfaction, health care delivery, public & private hospitals

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### INTRODUCTION:

The assessment of patients' satisfaction gives patients a voice. It helps public and private health service providers be more responsible for the quality of care they provide.<sup>1</sup> The healthcare sector of a country has social, political, moral, and business implications.<sup>2</sup> Compared to numerous other sectors' customer services, healthcare services are far more complex, co-productive, and intangible.<sup>3</sup> Patient satisfaction with healthcare is dependent on the perceived quality of service provided and treatment outcomes. These requirements must be met to minimize delays in seeking healthcare.<sup>4</sup> The satisfaction of patients undergoing treatment at a healthcare facility serves to analyze the quality of healthcare provided by that facility. Patient behavior is also strongly associated with the ability of healthcare service providers to meet patient demands.<sup>5</sup> Patient satisfaction has been assessed by using various parameters such as accessibility to care, cost of care, and the quality of care, out of which the latter was the most significant.<sup>6</sup> Some studies suggest that the hospitals' quality of care is a crucial determinant of patient satisfaction.<sup>7</sup> Healthcare providers' mainly focus on treating the diseases and providing medical advice to the patients. However, they should also provide a patient-centered service (i.e., social, psychological, personal, and economic aspects of

healthcare provision), closely matching patients' other needs, wants and preferences.<sup>8</sup> Research has shown that improving patient satisfaction leads to better compliance, continuity of care, and better health outcomes, all of which translate to improved healthcare quality.<sup>9</sup> A significant amount of research suggests that there has been a drastic change in the traditional "Doctor-Patient" relationship in recent years. Since patient satisfaction forms an essential component of policy-level decisions, this topic needs to be considered in detail.<sup>10</sup> Patients have clear-cut desires and expectations when they visit the hospital. The inadequate discovery of these desires can cause dissatisfaction among patients, leading to inadequate compliance and ultimately affecting healthcare quality.<sup>11</sup>

This study's objective was to determine patient satisfaction with the health services disregard of the public or private hospitals. The various dimensions of satisfaction were specifically assessed for understanding and determining the dimensions which may need further improvements. This will help in improving the quality of services provided by various hospitals.

#### **METHODOLOGY:**

The study design followed for the research was cross-sectional and was carried out throughout the country with no city or area restrictions. The entire process took approximately ten months from January 2020 to October 2020. Throughout these months, efforts were made to ensure the collection was not biased to ensure the research's authenticity. The sample size, calculated by using the EPI info version 7 sample size calculator, was 384. These calculations were done by keeping the level of significance at 5% and the confidence interval at 95% with an expected prevalence of 50%. The non-probability sampling technique was followed, which allowed the team to select people that were easier to approach. The level of patient satisfaction at the government and private hospitals was determined through various variables that included: the general satisfaction level, technical facilities, behavior and attitude of health care professionals, finances, and factors about the doctor and hospital such as waiting time, investigative facilities, hospital infrastructure,

The data was collected using an online questionnaire, which was designed using Google survey forms. A structured questionnaire with closed-ended questions using a Likert scale was used. The questions were provided in both languages i.e., Urdu and English. The inclusion criterion included age groups of 18 years and above disregard of the sex of respondents and who had visited the hospital in previous 3 months. The online survey was distributed by the research team belonging to various parts of Pakistan. The data gathered from the questionnaires was transferred into IBM SPSS version 26, and further statistical analysis was done. Further analysis using Pearson's Chi-square test was used to assess the association at the level of significance

5% and the confidence interval of 95%. The ethical permission was taken from the Ethical Review Committee (ERC) of Bahria University Medical and Dental College. In addition, informed consent was also sought from respondents.

#### **RESULTS**

Out of 384, 289 people responded to our questionnaire, which puts this study's response rate at 75.3%. The mean age of the participants was  $25.19 \pm 6.99$ . Among which 151 (52.2%) were males, and 138 (47.8%) were females. Only 12.5% of the participants were married. The participants belonged to different socio-economic backgrounds; 127 (44%) belonged to a high socio-economic group. 142 (49.1%) of the participants were employed. It was noted that 173 (59.9%) of the participants visited a private hospital compared to 78 (27.1%) who visited government hospitals during their last visit. Table 1 illustrates socio-demographic characteristics of the study population

Several variables were used to assess patient satisfaction, which had been classified into four major groups. The levels/scales assigned have been further merged to create two categorical groups of satisfied and not satisfied. In the group 1: satisfaction with doctors' quality, the main pointers of dissatisfaction were: side effects of medicines were mentioned; getting consent and explaining the procedure. The patients were relatively more unsatisfied because the bathrooms were not clean; this was noted in the group 2 for having basic facilities. Problems in getting an appointment, (high) fee charges, and lack of feedback mechanism were identified as means of dissatisfaction in the group 3 of 'process of seeking care'. One of the main sources of dissatisfaction was not getting medicines from the hospitals in the group 4 about satisfaction with medication and diagnostics. Further details can be seen in Table 2. As seen in Table 2, most patients found their hospitals, doctors, and other medical/paramedical staff to be satisfactory. However, the majority were not satisfied with the cleanliness of washrooms, registration waiting time, the ease of getting an appointment, explaining the medicines' side effects, explaining any procedure done, feedback taken from them at the end, and the provision of medicines by the hospital.

Further analysis of the satisfaction data was done to convert them into scores from each of the 4 above groups. Thus for each of the questions in each group were given a score of 0 for dissatisfaction and 1 for the satisfaction. This was then converted into the percentage scored for each group to ensure the comparability. Table 3 illustrates the scores achieved by each of the major groups related to satisfaction. The socio-demographic characteristics were also assessed for their association with overall satisfaction. It was noted that only the family monthly income was found to affect the overall satisfaction (p value=0.000) significantly.



**DISCUSSION:**

Patient satisfaction is an essential aspect of healthcare as it directly reflects a healthcare facility’s status. Our study inferred that most participants were satisfied with most of the proxy variables they were enquired about. Patient satisfaction is one of the universal goals of healthcare providers as it directly reflects the status of any healthcare facility.<sup>12</sup> Additionally, it helps achieve patient loyalty and competitive advantage.<sup>13</sup>

A study in Peshawar showed that 68% of patients were satisfied in the private sector versus 32% in public sector hospitals.<sup>10</sup> Another study conducted in Majmaah, Kingdom of Saudi Arabia, showed patients' level of satisfaction was 82%. The study showed that the most stated reason behind dissatisfaction was the unsuitable buildings (29%) of the health care centers. Also, a significant association was found between the level of patients' satisfaction with health care center services and the respondents' level of education.<sup>9</sup> The assessment of patient satisfaction should not be a one-off exercise, but it needs to be a continuously repeated action. This helps service providers learn their deficiencies, enabling them to undertake timely and appropriate alternative steps.<sup>14</sup> Interest in patient satisfaction is also supported by several studies that have demonstrated the positive impact of satisfaction assessment on hospital performance and patient willingness to comply with their treatment plan.<sup>15</sup> The socio-demographic characteristics and factors about hospital services are associated with patient satisfaction.<sup>16</sup> The public health sector is plagued by uneven demand and perceptions of poor quality. Countrywide, the underutilization of available facilities is of significant concern. The utilization of public health care services has been declining while the rate of utilization of private health care facilities for the same period has been increasing.<sup>17</sup> In a study conducted by Liu and Fang in 2019, patient’ satisfaction potential factors included the quality, cost, and convenience of the medical services.<sup>18</sup> The results of our study identified similar variables that played a role in determining patient satisfaction. This study also identified several other new variables that might impact a patient’s satisfaction, for example, providing medicines and obtaining feedback at the end.

Previous studies have shown that variables related to health care services like medical’ staff’s behavior, examination time, consulting time, and counseling time play a significant role in patient satisfaction.<sup>9</sup> However, our study’s results show otherwise as the difference between percentages of respondents satisfied and not satisfied with each of these respective proxy variables is not very much different.

In a study conducted by Mummalaneni and Gopalakrishna, multiple previous studies, several socio-demographic factors have been examined to have any association with patient satisfaction.<sup>19</sup> These may include age, gender, marital status, occupation, and monthly family income. Our study revealed

that only a patient’s family monthly income is associated with their satisfaction. The respondent’s age, gender, marital status, and occupation do not influence their satisfaction level with their care.( no significant P value in Chi-Square)

Some of the variables that play a role in patient satisfaction are modifiable, while some may not be modifiable. Some modifiable factors can be staff behavior, waiting time, and patient trust. Developed countries emphasize modifying their healthcare facilities and aiming to develop their economy by generating revenues through health tourism.<sup>20</sup> In England, the Department of Health (DOH) introduced a yearly national survey program that all NHS trusts had to survey patient satisfaction and report their management results. Therefore, patient satisfaction is a legitimate indicator for improving all healthcare organizations' services and strategic goals.<sup>21</sup> It is important to make sure that the issues related to healthcare delivery are promptly addressed.<sup>22</sup> It is recommended that medical service providers develop effective strategies that can help improve the modifiable variables that impact patient satisfaction.

This study had its limitations regarding conducting online surveys, time limitations, and differentiating the reported and observed activities in terms of doctor-patient interaction. It also did not consider the type as well as the severity of illness and the gender and age of the health providers. It is recommended more studies need to be conducted by addressing various dimensions for improving the overall satisfaction and hence the quality of care.

**CONCLUSION:**

Better health outcomes and treatment adherence can be achieved through improved patient satisfaction. According to our results, Our results only revealed that the lower family monthly income of patients is an important factor resulting in dissatisfaction. The problems in seeking care and

Table 1. Socio-demographic characteristics of the study population

<b>AGE</b>	
Mean age	25.19 (SD 6.99)
<b>SEX</b>	
Male	151 (52.2%)
Female	138 (47.8%)
<b>MARITAL STATUS</b>	
Married	36 (12.5%)
Single	253 (87.5%)
<b>FAMILY MONTHLY INCOME</b>	
10,000-50,000	64 (22.1%)
50,000-100,000	98 (33.9%)
>100,000	127 (43.9%)
<b>OCCUPATION</b>	
Government Employee	67 (23.2%)
Private Job/Personal Job	142 (49.1%)
Unemployed	80 (27.7%)

Table 2: The frequency distribution of satisfaction-related characteristics.

SATISFACTION VARIABLES	SATISFACTORY- N (%)	NOT SATISFACTORY- N (%)
<b>1. Satisfaction with quality of doctor:</b>		
Behavior of Medical Staff	199 (68.9%)	90 (31.1%)
Doctor's attitude	268 (92.7%)	21 (7.3%)
Doctor's knowledge	271 (93.8%)	18 (6.2%)
Doctor's attention	268 (92.7%)	21 (7.3%)
Doctor's explanation	239 (82.7%)	50 (17.3%)
Examination time	192 (66.4%)	97 (33.6%)
Consulting Time	192 (66.4%)	97 (33.6%)
Counseling Time	177 (61.2%)	112 (38.8%)
Was privacy observed	265 (91.7%)	47 (16.3%)
Treated with dignity and respect	272 (94.1%)	24 (8.3%)
Explained how to use the medicines	254 (87.9%)	35 (12.1%)
Side effects of medicines were mentioned*	60 (20.8%)	229 (79.2%)
Consent*	149 (51.6%)	140 (48.4%)
Procedure explained*	126 (43.6%)	163 (56.4%)
<b>2. Satisfaction with the environment and basic facilities:</b>		
Hospital Accessibility	263 (91%)	26 (9%)
Hospital Cleanliness	244 (84.4%)	45 (15.6%)
Hospital Comfortability	231 (79.9%)	58 (20.1%)
Facilities in the waiting area	289 (100%)	0
Clean washrooms*	89 (30.8%)	200 (69.2%)
Parking facilities	217 (75.1%)	72 (24.9%)
<b>Satisfaction with the process of seeking care:</b>		
The behavior of Paramedical Staff	198 (68.5%)	91 (31.5%)
Registration waiting time	128 (44.3%)	161 (55.7%)
Turn waiting time	234 (81%)	55 (19%)
Ease of appointment*	139 (48.1%)	150 (51.9%)
Paramedical/Medical staff was trained	275 (95.2%)	14 (4.8%)
Service charges*	151 (52.2%)	138 (47.8%)
Feedback was taken*	37 (12.8%)	252 (87.2%)
<b>Satisfaction with medicine and diagnostic facilities:</b>		
Laboratory facility	230 (79.6%)	59 (20.4%)
Radiology facility	221 (76.5%)	68 (23.5%)
Other investigative facilities*	194 (67.1%)	95 (32.9%)
Medicines were provided by hospital*	140 (48.4%)	149 (51.6%)
Vaccinations	189 (65.4%)	100 (34.6%)
<b>Overall Satisfaction*</b>	<b>257 (88.9%)</b>	<b>32 (11.1%)</b>

Table 3: Scores achieved by various dimensions of satisfaction

Satisfaction scores distribution	Score Mean (SD)	Cumulative percentage score achieved
The doctor's quality. (Scored 0-15)	10.98 (3.17),	73.2%;
The environment and basic facilities. (Scored 0-6)	4.61 (1.14)	76.8%;
The process of seeking care. (Scored 0-7)	4.02 (1.11)	57.4%;
The medicine and diagnostic facilities. (Scored 0-5)	3.37 (1.38),	67.4%.
<b>Cumulative satisfaction score (Scored 0-33)</b>	<b>22.98 (4.90)</b>	<b>76.3%</b>

inadequate medicines and diagnostic facilities thus influence the lack of satisfaction of the patients. The general satisfaction masquerades the various dimensions that may need to be addressed to improve the satisfaction of patients; this study has unveiled some of those exciting dimensions.

**Authors Contribution:**

**Neelam Jawed Qureshi:** Led the team including contributions in all phases of research.

**Inayat H. Thaver:** Supervised & contributed from conception to writing of article, reviewed & Improved the article and conducted a detailed analysis of data

**Omer Shahid:** Objectives defining, questionnaire designing, Data entry, Data Analysis, Results writing, literature review, data collection

**Manahil Khalid:** Introduction writing, objective defining, questionnaire designing, literature review, data collection.

**Zuhaib Arshad:** Methodology writing, questionnaire designing, data collection.

**Munza Yusuf:** Abstract, data collection

**Mashal Sarwar:** Data collection, sample size calculation, methodology

**Hafiz Hussain:** Data collection, literature review

**Wara Fatima:** Data collection

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## Angry Gut: Irritable Bowel Syndrome

Izrum Shafi Rajput, Syed Ijaz Hussain Zaidi, Sajid Abbas Jaffri, Syed Wajahat Hasib, Kashif Razaq

### ABSTRACT

Irritable bowel syndrome (IBS) is a functional disorder of the intestine characterized by abdominal pain and altered bowel habits. At present, no biological marker has been identified. Hence, the disease is clinically assessed on the basis of the symptoms according to ROME IV criteria. Epidemiological data revealed that the prevalence of IBS varies widely around the world, and more thorough research is needed to pinpoint any discrepancies that may exist between countries, as well as possible reasons. Both pharmacological and non-pharmacological therapy is being used in order to treat IBS. There is no specific treatment for irritable bowel disease that has come across the patients and only possible measures have been taken to treat the severity of symptoms. Symptomatic treatment with spasmolytic agent like mebeverine has been considered a standard therapy to relieve pain but to deal with constipation and diarrhea different treatment modalities have been adopted by the physician.

**KEY WORDS:** Constipation, Diarrhea, Irritable bowel syndrome, ROME IV criteria.

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### INTRODUCTION

Irritable bowel syndrome is a functional disorder of intestine associated with persistent pain, irregular bowel habits, and abdominal cramps. In order to diagnose IBS clinically, the Rome IV criteria is been widely used. In order to implement this criteria, persistent pain in the abdominal region is occurred in the previous 3 months for at least 1 day per week; with two or more of the following associations :1) defecation-associated, 2) associated with alteration in frequency of stool, 3) correlated with a modification in stool form.<sup>1</sup>

Worldwide, the prevalence of disease is varied, but in Pakistan the prevalence of this disease is 45%. Epidemiological information uncover that the pervasiveness of IBS fluctuates generally all throughout the planet, and more intensive exploration is expected to pinpoint any errors that might exist between nations, that could be the expected reasons. In relation with scientific evidences and several changes have been made in diagnostic criteria and sub classification of IBS to date. IBS is not a solely condition but an array of symptoms with clinical differences in its sub types. It is prevalent in all age groups that have a chiefly influence on healthcare systems and unpleasantly affecting eminence of life.<sup>2</sup> On the premise of stool pattern, the syndrome has been sorted out into four categories: irritable bowel syndrome accompanied by diarrhea (IBS-D), irritable bowel syndrome associated with constipation (IBS-C), a mix of diarrhea and constipation associated irritable bowel syndrome (IBS-M), or undefined predominant stool form of irritable bowel syndrome (IBS-U).<sup>3</sup>

### METHODOLOGY:

Following search engines such as Google scholar, Pub med and Cochrane library were used to retrieve data. Almost about 70 articles were being reviewed from year 2016 to 2021. From these, 10 were of pediatric, 5 were animal study, 3 were abstract only and 2 were non-English version therefore they were excluded. A total number of 51 articles well assessed in order to write this article. The key words were irritable bowel syndrome, constipation, ROME IV criteria, infections, functional disorder, gut-brain axis, anti-spasmodic, laxatives, pathophysiology. The main focus in this article is on pathophysiology and treatment modalities regarding the management of this disease.

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**PATHOPHYSIOLOGY**

Exact pathophysiology is still idiopathic but multiple factors are considered as aggravating or triggering. It's thought to be a condition caused by a complex combination of circumstances. Although genetic/social learning variables, food, microflora, gastrointestinal moderate inflammation, and aberrant gastrointestinal endocrine cells have all been proven to play a vital role. Literature review spotlighting the contradictory data on the occurrence of circumstances in association with the disease.<sup>4</sup> Generally, the focus is mainly on alterations in gastrointestinal motility and visceral hypersensitivity. Despite the fact that irritable bowel syndrome (IBS) symptoms are mainly concerned to both small intestinal and colonic motility, no familiar correlation of motor activity has been appeared as a diagnostic marker for IBS.<sup>5</sup>

**GASTROINTESTINAL MOTILITY:**

Motor activity of the bowel maybe one of the markers for IBS. Even though more attention has been given to small intestinal and colonic motility as the manifestation of IBS, no major pattern of this activity has emerged.<sup>6</sup> However, motor anomalies of the gastrointestinal tract (GIT) are spotted in few patients with IBS. Some anomalies observed comprise of heightened motor response to cholecystokinin and food ingestion in IBS (diarrhea-predominant), and greater frequency and irregularity of contractions of the lumen, extended transit time in IBS (constipation-predominant). Stimulation of gut motility in IBS patients pharmacologically, has resulted fruitful results in improving symptoms and decreasing gas retention, implying that disturbance in motility is the underlying complaint in some patients.<sup>7</sup>

**VISCERAL HYPERSENSITIVITY**

Irritable bowel syndrome (IBS) patients commonly experience extreme visceral sensitivity due to irritation. The stimulation of different receptors in the gut wall promotes sensibility in the intestinal (GI) tract. The above receptors send nerve impulses via afferent neural circuits to the posterior horn of the spinal cord.<sup>8</sup> A major contributing factor to the symptoms in IBS is visceral hypersensitivity (VH)

which is a complex mechanism arising either in the central nervous system or the peripheral nervous system. Visceral hypersensitivity plays a vital role in pathophysiology and intensity of this disease. As a result, controlling VH can significantly reduce IBS symptoms.<sup>9</sup>

**GENETIC INFLUENCE**

According to the analysis of genetic polymorphisms (CRH-related), IBS-linked cognitive problems and tolerance to stressful events were affected by the CRH-BP SNP rs10474485<sup>10</sup>. Researchers identified COL6A1 rs13051496, a one-of-a-kind risk variant for IBS-D.<sup>11</sup> When IBS patients (584) and asymptomatic controls (1380) were tested after sequencing the SCN5A gene, 2.2 percent of the IBS cases showed physiologically detrimental mutations while the asymptomatic controls showed none<sup>12</sup>.

**ALTERATION IN GUT MICROBIOTA**

In the etiology of IBS, dysbiosis of the gut microbiota is thought to be a new element. The gut microflora plays an essential part in the advancement of inborn immunity, normal GI physiology, and the fermentation of ingested carbohydrates. A variety of GI syndromes (including IBS) have been a result of changes in structure and balance of the gut microflora<sup>13</sup>. According to the pathophysiological theory of a rise in Bacteroidetes and a decrease in Firmicutes, dysbiosis with bacterial imbalance was identified as an important component of this disease.<sup>14</sup>

**LOW GRADE MUCOSAL INFLAMMATION AND IMMUNE ACTIVATION**

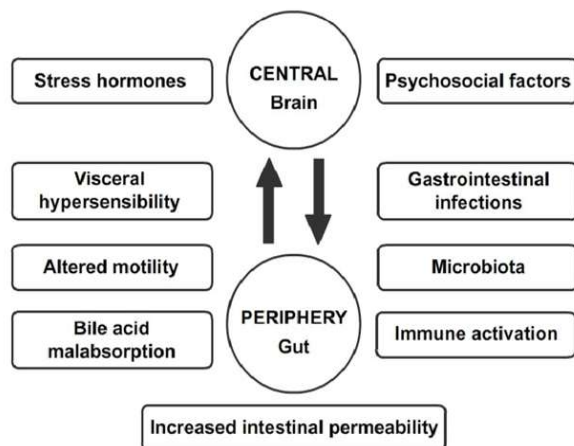
Some IBS symptoms (e.g., flatulence, dissatisfaction, and increased intestinal transit time) were related to particular gut microbial composition and elevations in proinflammatory mediators in individuals with IBS.<sup>15</sup>

**DIETARY INFLUENCE**

The digestive system engages a number of complicated systems when a meal is consumed, allowing it to execute the complicated task of digestion and nutrient absorption, as well as waste ejection. In ordinary conditions, gut has specialized response with a properly controlled set of neuro-immune interconnections that is expected to sustain optimal gut activity and homeostasis. Nutritional variables, on the other hand, could be hazardous in some cases, causing intolerant, allergic, or hypersensitive through a variety of processes.<sup>16</sup>

**ALTERATION IN GUT-BRAIN AXIS**

The gut and its activities (metabolic, immunological, and neuroendocrine) are connected to the neurological system and psyche via the gut-brain-microbiota axis. The gut microbiota influences the growth of the hypothalamic-pituitary-adrenal axis (HPA-axis).<sup>17</sup> Along with an effect on social cognition, incentive, and emotional response pathways, suggests that endurance and cognitive adaptability



to stressors are significant. Stress, on the other hand, can reduce the diversity and makeup of the intestinal flora.<sup>18</sup>

#### **BILE ACIDS ABSORPTION**

Bile acids are lipophilic and hydrophilic amphiphatic compounds. They are released into the small intestine by the liver in response to food ingestion to facilitate lipid and fat-soluble vitamin absorption.<sup>19</sup> Despite the fact that IBS has a wide range of symptoms, in comparison to controls, patients with IBS demonstrated substantial differences in network connections between food and fecal microbiomes, as well as differences in fecal metabolomes. Patients with IBS who have BAM can be distinguished by fecal metabolome profiling. These findings could lead to the development of microbe-based therapies for these illnesses.<sup>20</sup>

#### **TREATMENT OF IBS**

##### **PROBIOTICS:**

Probiotics are microbes that, when given in sufficient proportions, boost the host's health and may be a therapeutic strategy for disorders defined by dysbiosis, such as IBS. In IBS patients, probiotics give a therapeutic benefit above placebo in terms of overall symptoms while also showing a good safety profile.<sup>21</sup> Probiotics are essential for maintaining a healthy microflora in the small intestine (eubiosis) and preventing the formation of harmful microbiota.<sup>22</sup> A handful of studies investigating the impact of probiotics on IBS patients have been conducted, with many of them reporting positive results. Several studies, on the other hand, found no improvement when compared with the control. The disparity could be attributable to study subject variability, probiotic composition, and usage, as well as procedural discrepancies between trials.<sup>23</sup> Many RCT with probiotic *Streptococcus thermophilus* UASt-09 showed great potentials in reprocessing gastric mucosa and gastrointestinal wellbeing colonic epithelial cells by analysing gene expression of mucus biosynthesis and intestinal immune response markers.<sup>24</sup> Some clinical trials reported the usage of *Saccharomyces cerevisiae* CNCM I-3856 in IBS improved stomach pain and stool consistency in people with IBS due to its analgesic and anti-inflammatory effect.<sup>25</sup> When compared to some live strains, using effective, non-viable bacterial strain preparations has several significant advantageous.<sup>26</sup>

##### **VITAMIN D:**

Vitamin D having previously been reported to have an important role in metabolism of calcium and phosphorus. Several recent research have revealed new information on vitamin D's role in the body, including its immunomodulatory and anti-inflammatory properties. Vitamin D insufficiency is predicted to affect 30–50 percent of the world's population, which seems to be a prevalent percentage in GI disorders.<sup>27</sup> In comparison to the control subjects, patients undergoing vitamin D therapy experienced a considerably larger reduction in IBS symptoms such as abdominal discomfort and

abdominal distension, gas, rumbling, and overall gastrointestinal (GI) symptoms.<sup>28</sup> Low vitamin D level is widespread in IBS patients, according to the research, and should be assessed in order to improve the health state. It's been hypothesized that there's an inverse relationship between plasma vitamin D and the intensity of IBS symptoms, and vitamin D supplements can help to improve symptoms. The present RCTs, however, do not provide robust, generalizable data; bigger, appropriately powered interventions are needed to make a case for vitamin D therapy in IBS.<sup>29</sup>

##### **ALO VERA:**

Aloe vera (AV) is a medicinal herb being used traditional medicine to treat a variety of ailments. Immunomodulatory characteristics of aloe vera as glucomannans, acemannan, and mannose are present, aloe vera may likewise have a prebiotic potential with expansions in bifidobacterial. Studies have looked into whether aloe vera could help with IBS symptoms because of these physiological properties. Hepatoprotective, anti-inflammatory, and anti-ulcerative properties have been demonstrated. The aloe reduced the severity of stress-induced IBS at all doses tested, but not in a dose-dependent manner, by reducing intestinal MPO activity and improving oxidative stress status.<sup>30</sup> Aloe vera is frequently used as a laxative and to increase gastrointestinal peristalsis. In people with constipation, aloe vera can help relieve gastrointestinal pain and discomfort, as well as flatulence. While it can't help with urgency or frequency, it can help with pain in these patients, as well as the consistency of their stools.<sup>31</sup>

##### **PEPPERMINT OIL:**

Peppermint oil is thought to have a variety of digestive effects, including antispasmodic, carminative, and antiemetic properties, as well as other digestive effects.<sup>32</sup> Irritable bowel syndrome patients have been reported to benefit from peppermint oil, which has been shown to alleviate abdominal pain. It is evident that peppermint oil relaxes intestinal smooth muscle and desensitizes nociceptive nerve afferents.<sup>33</sup> The blocking of calcium channels that influence smooth muscle is assumed to be the mechanism of action for these antispasmodic effects.<sup>34</sup>

##### **COGNITIVE BEHAVIOUR THERAPY IN IBS:**

Visceral hypersensitivity, central processing impairments, and visceral anxiousness are among the psychological and central processing factors that contribute to brain–gut disruption, according to research. These cerebral processes have a role in the onset and progression of the condition, and psychological treatments that tackle these cognitive processes can have a direct impact on the brain–gut axis, resulting in symptom relief. While Cognitive conduct treatment for IBS is very compelling, the restricted accessibility of skilled advisors and absence of admittance to treatment stay tricky.<sup>35</sup>

### **DIETARY FIBERS:**

Different forms of dietary fibers have distinct physical and chemical structures, and the health advantages of each fiber type are unique.<sup>36</sup> Dietary fiber's laxative effects are one of the mechanisms of action in IBS. By mechanically stimulating/irritating the colonic mucosa and boosting secretions and peristalsis, insoluble dietary fiber increases fecal bulk and speeds intestinal transit. Dietary fiber's interaction with the microbiota and the immune system.<sup>37</sup> Dietary fiber appears to work as a prebiotic, influencing the composition of the gut microbiota, according to a growing body of research.<sup>38</sup> Dietary fiber appears to improve all symptoms of IBS, including abdominal discomfort, bloating, digestion, and changes in bowel habits, possibly by affecting the gut nervous system, PH changes, and lumen pressure in the intestine, as well as stimulating the release of serotonin hormone, which is important for visceral sensitivity. Short-chain fatty acids, which are formed by dietary fiber, have an effect on a number of intestinal hormones, including neuropeptide YY (PYY) and glucagon-like peptide. Prostaglandin E2 and vasoactive polypeptide, in addition to PYY, reduce intestinal stimulation, which could explain the effects of dietary fiber on the gastrointestinal tract and its secretions.<sup>39</sup>

### **LAXATIVE:**

In people with IBS, laxatives are commonly used to treat constipation. Bulking agents, osmotic laxatives, stimulant laxatives, and surfactant laxatives are the four types of laxatives accessible. Bulking agents (such as wheat straw, corn fibers, calcium polycarboxylate, and ispaghula/psyllium husk) are commonly used to speed intestinal transit in IBS patients.<sup>40</sup>

In IBS, psyllium is the most effective. The fiber's water retention capacity is the first consideration. Water is absorbed and retained by soluble fiber. As a result, the water-holding capability of soluble fiber aids in constipation relief. The fiber's viscous/gel-forming capacity is the second quality. This property makes the fiber viscous, allowing it to pass through the gastrointestinal tract easily. If the bowel movement is too slow (constipation), the viscous fiber speeds it up; if the bowel movement is too quick (diarrhea), the viscosity slows it down and lengthens the transit time. The level of fiber fermentation in the gut is the third quality. A fiber that ferments well would be neither water-resistant nor viscous. Bloating and aggravation of IBS symptoms are caused by gas produced as a result of excessive fermentation.<sup>41</sup>

Patients with neat, soft stools that are difficult to pass should use a stimulant laxative. Because they have the potential to cause addiction, they are only indicated for short-term, infrequent usage. Tachyphylaxis and dependence are linked to stimulant laxatives.<sup>42</sup>

Lubiprostone is a type 2 chloride channel agonist. Lubiprostone enhances chloride-rich fluid secretion and

lubrication of the gut mucosa. These secretions soften the faeces, enhance motility, and encourage the bowels to move on their own. Lubiprostone is a medication that is both safe and effective in the treatment of IBS-C.<sup>43</sup>

Linaclotide is a peptide guanylate cyclase-C agonist that increases fluid secretion into the intestinal lumen. It is a minimally absorbed peptide guanylate cyclase-C agonist. Fluid secretion boosted transit, most likely by stimulating stretch and distention sensitive local receptors. Linaclotide improves bowel function and decreases IBS-C symptom severity by reducing stomach discomfort, bloating, and overall symptom severity.<sup>44</sup>

Osmotic laxatives are administered if the stools remain firm. Osmotic laxatives are poorly absorbed by the gut and cause water to be secreted into the intestinal lumen, softening and easing stool transit. Osmotic treatments for chronic constipation, such as polyethylene glycol (PEG), lactulose, sorbitol, and magnesium hydroxide, are affordable and have been validated in RCTs.<sup>45</sup>

### **ANTISPASMODICS:**

Patients suffering from discomfort or abdominal pain should use antispasmodics (anticholinergic drugs). They act by inducing smooth muscle in the bowel to relax. They treat a subset of IBS patients who have aberrant gastrointestinal smooth muscle contractility and altered gastrointestinal transit, both of which contribute to discomfort and stool irregularities.<sup>46</sup>

Because otilonium bromide is mostly made up of quaternary ammonium, it is only poorly absorbed from the gastrointestinal system. Otilonium bromide inhibits muscarinic receptors as well as L-type and T-type calcium channels. It promotes spasmolysis while lowering peripheral sensory afferent input to the central nervous system, resulting in increased efficacy. These findings show that otilonium bromide may be useful in lowering spasms and stomach pain, which are two of the most common symptoms of IBS.<sup>47</sup>

Pinaverium bromide is a quaternary ammonium derivative that functions as an antispasmodic drug in the gut smooth muscle cells by inhibiting both muscarinic receptors and calcium channels. In vitro studies have shown that PB binds to the -1 subunit21 of l-type (long-lasting) voltage-operated channels on the outside of intestinal smooth muscle cells, inhibiting calcium channels. The principal mechanism for triggering contractile activity is calcium entry into these channels; consequently, inhibiting them produces an antispasmodic action. One of the most distinguishing characteristics of PB is its low systemic absorption and focus on the gastrointestinal tract rather than the cardiovascular system, resulting in a high safety profile.<sup>48</sup>

Mebeverine, a beta-phenylethylamine obtained from reserpine, acts on smooth muscle cells in a rather particular manner without exhibiting atropine-like effects in humans.



It decreases the accumulation of intracellular calcium by blocking sodium channels directly, and it was three times more effective than papaverine at decreasing the ileal peristaltic reflex.<sup>49</sup> It is an antispasmodic agent that directly affect smooth muscle of intestine hence alleviating spasm without acting on motility of gut. Antispasmodic have excellent safety profile, but the inflicting action of mebeverine is still unknown yet its numerous actions like reduced ion permeability, reuptake of nor-adrenaline was blocked, acting as a local anesthetic, anti-muscarinic and phosphodiesterase inhibitory out-turn might put-up to the local effects of mebeverine.<sup>50</sup> The drug produced regulatory effects on bowel function no indication of adverse effects have been seen with the drug in previous studies like nausea, vomiting, heart burn, constipation, headache, indigestion, dizziness.<sup>51</sup>

### CONCLUSION:

Despite of evidences in literature, various IBS therapies have questionable efficacy. Irritable bowel syndrome (IBS) is a commonly encountered bowel problem that practitioners face on a regular basis. Though IBS is not life threatening, but its chronic nature has a negative impact on patients' quality of life. In addition to that, it may have a great financial burden on the healthcare system. The identification of specific symptoms and the elimination of other organic disorders are used to diagnose IBS. Treatment for irritable bowel syndrome (IBS) is complicated due to the intricacy and variety of symptoms. There are few trials that provide solid evidence of effectiveness in treating the IBS symptom complexity. IBS has no clear cure, however it can be managed by avoiding exacerbating variables such as specific medicines, stressful situations, and dietary changes. IBS has traditionally been treated symptomatically. A personalized, comprehensive approach to IBS management that includes dietary adjustment, lifestyle amendment, pharmacological, and behavioral therapies are most effective. We did a systematic evaluation of the existing literature on pharmacologic therapy of irritable bowel syndrome to provide evidence-based guidance for clinicians.

#### Authors Contribution:

**Izrum Shafi Rajput:** Selection of topic, introduction, literature review, conclusion

**Syed Ijaz Hussain Zaidi:** Abstract writing, methodology

**Sajid Abbas Jaffri:** Clinical diagnosis, pathophysiology

**Syed Wajahat Hasib:** Visceral hypersensitivity and gastrointestinal motility

**Kashif Razaq:** Laxatives and current clinical guidelines

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## Esthetic and Cost Effective Management of Young Female with Moderate Fluorosis Using Microabrasion;

Umeed Jawaid, Muhammad Rizwan Nazeer, Ayesha Jawed, Meisha Gul

### ABSTRACT:

Primary concern of majority of young patients visiting dental OPD is compromised dental esthetics or dental pain. Discolorations have significant social and esthetic effects. Fluorosis is one of the most common cause. It is prevalent in different areas of Pakistan. Microabrasion was selected for treatment of discoloration in this case report. Microabrasion was performed using slurry made by combining 37% phosphoric acid and pumice. This slurry was applied on the labial tooth surface and mechanically rubbed with a prophylaxis brush in a slow hand piece for a minute, with gentle pressure. The cycle was performed thrice followed by fluoride application. The results of this conservative treatment were satisfactory and patient was satisfied with the esthetic outcome.

**Keyword:** Esthetics, Dental Microabrasion, Tooth Discoloration,

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### INTRODUCTION:

Primary concern of majority of young patients visiting dental OPD is either compromised dental esthetics or dental pain. Discolorations have significant social and esthetic effects.<sup>1</sup>

Discoloration could be white, yellow-brown or brown opacities that could be involving the whole dentition or just one tooth. Also they might be intrinsic or extrinsic in nature. Extrinsic stains could be because of tobacco usage, food dyes or due to plaque and calculus accumulation. Whereas intrinsic stains may be due to tetracycline staining, dental fluorosis, developmental problems like dentinogenesis and amelogenesis imperfecta or even due to injuries.<sup>2</sup>

Fluorosis is one of the most common causes of staining. It is prevalent in different areas of Pakistan where the fluoride content is high in drinking water, according to literature conducted in 2020 shows 100% prevalence among the

subjects which were exposed to 6-8mg/dl where as 17.4% in subjects exposed to fluoride levels of 0.30mg/dl.<sup>3</sup>

There are different treatments options available for the fluorosis depending upon the severity and depth. The severity of fluorosis can be evaluated as per Dean's index. Stains that are present on the outer layers of the enamel could be corrected by conservative methods like microabrasion. If stains are deeper than other treatment options like bleaching with hydrogen peroxide, direct veneering or crowns may be opted.<sup>4</sup> One of the most time consuming, costly and non-conservative methods available are ceramic veneering which may be used for deeper stains.<sup>5</sup>

The microabrasion is second most conservative technique after bleaching that removes the porous enamel layer and the stains by rubbing acid gel and an abrasive compound. The defect is removed by a combination of erosive and abrasive effects of the mixture. This should be the first option for management of teeth with intrinsic stains because it is safe and minimally invasive, also it can be combined with bleaching when necessary.<sup>6, 7</sup> In this case report microabrasion is used for the correction of patients staining.

### Case Report:

A 24-year old girl came to the BUMDC dental OPD with presenting complaint of brown discoloration of teeth. She had esthetic concerns and felt under confident due to the stains. She said she hardly smiles with her teeth show. Her medical history was non-significant. But her childhood house was supplied by a well and its water contained slightly high levels of fluoride as her siblings also had similar staining.

Upon examination, yellowish-brown stains were found on

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Figure 1:

A: Pre-operative intraoral clinical photograph showing frontal view of case of moderate fluorosis

B: Pre-operative intraoral clinical photograph showing lateral view of case of moderate fluorosis



Figure 2:

A: Rubber Dam isolation before application of slurry made of 37% phosphoric acid and pumice

B: Clinical photograph showing application of slurry made of 37% phosphoric acid and pumice

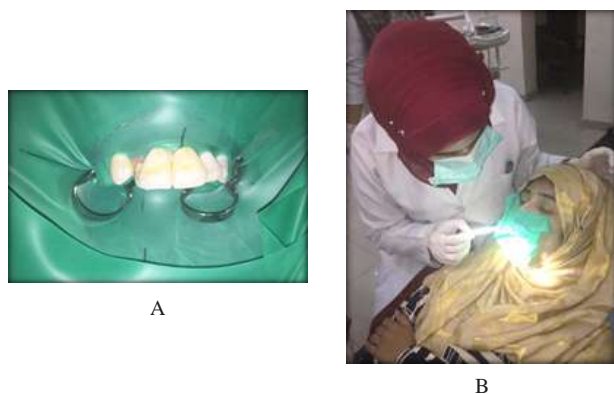


Figure 3: Post-operative Clinical Photograph after microabrasion and fluoride application



her upper anterior teeth, especially on the centrals according to the Deans index of 4 indicating moderate fluorosis. Her oral hygiene was good with restorations in her upper molars and missing lower molar. Radiographically, all the maxillary anterior teeth displayed a uniform PDL space and intact lamina dura. The colour and texture of the lesions led to the diagnosis of mild to moderate dental fluorosis. (Fig 1)

The patient and her parents were provided with treatment options of bleaching, microabrasion and partial veneering.

Patient opted for microabrasion only. She was explained. She agreed to go ahead with it. At the initial visit, pictures were taken and isolation was achieved by rubber dam. (Fig 2) Next, 37% phosphoric acid and pumice made into slurry was applied on the labial tooth surface and mechanically rubbed with a prophylaxis brush in a slow hand piece for a minute, with gentle pressure. This cycle was performed thrice. Between each cycle the teeth were washed and dried. After final evaluation, fluoride varnish (Duraphat® Fluoride Varnish Woelm and Pharma, Eschwege, Germany) was applied. Post-operative pictures taken.(Fig 3)

Following microabrasion, the brown opacities on the maxillary central incisors became less obvious but were still visible. The patient and her parents were given post-operative instructions and instructed to avoid food and drinks with colouring for the next two days.

The patient was called on a follow-up visit after 3 months. The brown opacities although were still present but were not as prominent as they were before treatment. The treatment option was not the ideal but, the patient was very happy with the results.

#### DISCUSSION:

For many years, micro abrasion has been the technique of choice for management of dental fluorosis.<sup>8</sup> It produces an enamel loss ranging between 25-200 micrometers. Also it produces a prism-free enamel surface that reflects and refracts light in such a way that the surface seems smooth, regular and lustrous.<sup>9</sup>

The technique of micro abrasion possess minimal risks and its side effects are close to rare (unless the patient doesn't follow the post-operative instructions). Comparatively the procedure is very simple, good results are frequently observed with minimal harm to the dentition therefore resulting in its success.<sup>10</sup>

In some cases, vital bleaching is practised after micro-abrasion. Since after micro-abrasion, teeth can have a slightly yellowish appearance because dentin shows through the translucent enamel, therefore bleaching is used to enhance the results.<sup>11</sup> A randomised control trial was conducted by Balan B et al in 2013, which compared micro-abrasion with and without bleaching for patients with fluorosis. It came to a conclusion that there was no difference in outcomes of both techniques. Although it does summarize that a combination of two techniques is an effective way of reducing enamel fluorosis staining and also patient satisfaction was better when both techniques were used.<sup>12</sup>

In the present case report the patient was provided with the treatment of micro-abrasion, which was performed by using the materials available in the OPD including 37% phosphoric acid gel mixed with pumice to create a slurry. This material was used as it was easily available and cost effective at the same time and the process was completed almost in an hour.



Studies show that microabrasion can provide satisfactory results in mild to moderate fluorosis<sup>13</sup> but for the best outcomes microabrasion can be combined with bleaching and resin infiltration. Resin infiltration shows immediate improvement of esthetics by changing the refractive index of deeper hypo mineralised layers. The patient was quite happy with the immediate results as the stains at upper maxillary teeth lightened with this technique. Hence, enamel micro-abrasion is very effective method with minimal intervention

#### CONCLUSION:

This case report demonstrates that conservative method of microabrasion can successfully treat the esthetic appearance caused by fluorosis. But while formulating a treatment plan, patient's wishes and conservation should be a priority.

In this case at the end of the treatment, an extremely pleasant esthetic result was observed along with patient satisfaction.

#### Authors Contribution:

Umeed Jawaid: Write up  
Muhammad Rizwan Nazeer: Study design  
Ayesha Jawed: Write up  
Meisha Gul: Proof Read

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## Lack of Awareness About Obstetrics Physical Therapy in Pakistan

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Respected Editor,

This letter aims to explain the role of obstetrical physical therapy in pregnancy to highlight the awareness related to physical therapy in Pakistan.

Obstetrics physical therapy is a sub-category of physical therapy, in which physical therapist deals with the musculoskeletal, neurological other pain related issues of women during and after pregnant.<sup>1</sup>

During pregnancy majority of women gain excessive weight which may leads to musculoskeletal and metabolic disorders resulting in difficult labor and delivery.

Weight gain and gestational diabetes is one of the leading problems during pregnancy, hence exercises during pregnancy may reduce the risk of these problems.<sup>2</sup>

Muscular imbalance and excessive weight may also cause urinary incontinence during and after pregnancy. Strengthening of pelvic floor muscles (which controls urinary incontinence) during gestational and after gestational period reduces the urinary incontinence.<sup>3</sup>

Postpartum depression is also a common problem among all other issues during and after pregnancy, exercise programs during and after pregnancy significantly reduces the depressions among females.<sup>4</sup>

In modern world awareness of obstetrics physical therapy had been evolved widely. Studies showed effectiveness of physical therapy in obstetrics. Physical therapy in Diastasis Recti showed significant effectiveness.<sup>5</sup> Kinesio taping along

with breathing exercises also play an effective role in reducing labor pain.<sup>6</sup>

To increase awareness for obstetrics physical therapy, physical therapist must play an important role. Physical therapist should work with obstetricians and gynecologist to have maximum excess for female health issues. Small group sessions or health camps related to role of physical therapy in female health issues may also have impact on awareness among females. Use of print and digital media also plays an important role in awareness program.

### Authors Contribution:

**Rabia Khan:** Concept and Idea  
**Muhammad Usman:** Proof Reading  
**Ghousia Shahid:** Proof Reading

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The Cardiac Society of Australia and New Zealand. Clinical exercise stress testing. Safety and performance guidelines. *Med J Aust* 1996; 164: 282-4

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