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The correlation between ABO Blood Groups, Rh factor and Body Mass Index in most common oral diseases

Dr. Esra Hassan Al –Hashemy. BSC, M.Sc ,Ph.D. *
Dr. Maha Jamal Abbas. B.D.S, M.Sc. **

Abstract

Objective:-The presence of specific type of blood group antigens have been associated with various diseases, with antigens also acting as receptors for infectious agents and the relative susceptibility of some blood group phenotypes to certain oral diseases has been investigated. Also, the poor oral health and develop of some oral disease has previously been related to high body mass index (BMI).

Aims of the study :-The the aim of this study was to indicate if any association between ABO blood system and body mass index with several oral diseases includes gingivitis and periodontitis.

Material and method :-A total of (82) subjects were included in this study collected from hospital of dentistry college from February to July,2013,divided into three groups as those with gingivitis, periodontitis, and the healthy ones consider control group, aged between (10 and 55)years were selected on a random basis . ABO blood groups were detected by using slide agglutination method after collected of blood samples .BMI was measured for all groups.

Results: The results of this study reported that blood group type (O) appear in high percentage (50%) among patients group include(gingivitis and periodontitis),and the blood group (A)showed a high percentage (47.67%) in healthy group with statistical significant differences ($p < 0.05$) while, the least rate of blood group in oral disease group were (AB)(7.5%) and (O and B)(14.29%) in control. The results of RH factors showed a significant increase of Rh-positive in all examined groups. The body mass (mean ±SD) (26±3.056) $kg/m^2$was significantly higher patient group when compared to control(BMI= 22.71±3.241) kg/m^2 with p value< o.o5 .while the statistical analysis revealed there were non-significant differences according to type of blood groups between male and female and the mean of BMI not differed between gingivitis and periodontitis $p>0.05$.

Conclusion: Significant relationships between ABO blood type and body mass index with most common oral disease while RH results revealed no significant differences were recorded between control and oral disease.

Key Words: ABO blood group, oral disease, Rh factor, body mass index

Introduction

The history of investigations regarding the relation between blood groups, Rhesus (Rh) factor and dental diseases goes back to 1930.

* Lecturer in Basic Science Department Dentistry college Al-Mustansiriya University
**Lecturer orthodontic, pedodontic and preventive dentistry Department/Dentistry college Al-Mustansiriya University

[(1)]Landsteiner first reported that existence of serologic differences between individuals, allowing him to classify people into one of four groups depending on whether their red cells contained agglutinogen "A," agglutinogen "B," neither A nor B (O) or both A and B (AB). This discovery led to a series of serologic, genetic and immunochemical studies that are continuing even at the present time. [(2, 3)]

Periodontal disease is the most prevalent disease, the most common oral disease, is a destructive inflammatory disease of the supporting tissues of the teeth and is caused by specific microorganisms. [(4)] .As a rule, PD develops through gingivitis, an inflammation of the marginal periodontium. However, not every gingivitis develops further into PD. Both the amount and virulence of the microorganisms and the resistance factors of the host (risk factors and immune status) are crucial for the progression of the periodontal with a multifactorial etiology, affecting a large population worldwide. Plaque, being the primary etiologic agent, probably of genetic origin, may play a part.) [(1)]

The antigens of the ABO system are an integral part of the red cell membrane, which are also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and anomalies, with antigens also acting as receptors for infectious agents. Immune histochemical studies have demonstrated the presence of A/B antigens on spinous cells in the non-keratinized oral epithelium of blood group A and B persons, where basal cells express precursor structures and the more-differentiated spinous cells express the A or B antigens. Blood group O persons who do not have the A and B gene-coded glycosyltransferase express a fucosylated variant (Ley) of the precursor structure. [(6)]

The tissue localization of the histo - blood group antigens has shown that the antigens in the tissues correspond to the erythrocyte blood group, but the tissue expression is dependent on the secretor status of the individual. Secretor status is secretion of blood group antigens ABO (H), which may be a factor influencing the development of systemic oral diseases. [(12)]In the stratified epithelium, the expression of histo-blood group antigens depends on the state of cellular differentiation and maturation, and there is a sequential elongation of the terminal carbohydrate chain during the life span of the cell. Basal cells express short carbohydrate chains that are A/B precursor\s, whereas A or B antigens may be seen in the spinous cell layer. Variation in the differentiation patterns between keratinized vs. non-keratinized epithelium influences the expression of blood group antigens. Keratinized squamous epithelium may express A or B antigens in only very few and highly differentiated cells, leaving the precursor H antigen expressed on most spinous cells. [(13)]

The relative susceptibility of some blood group phenotypes to certain diseases has been investigated. In some studies confirmed that Blood group and individuals have been reported to be more susceptible to gall stones, cholitis, [(7)] and tumors of pancreas as well as ovary. [(8)].While, blood group phenotype O was associated with a substantially increased risk for coronary artery disease (CAD). [(9)]Diabetes mellitus might be highly prevalent in subjects of blood groups A and O [(10)] for several decades, the ABO blood group has been suspected of contributing to infertility and fetal loss, but reports have often been conflicting

and speculative. This has resulted in a large accumulation of literature and a high degree of controversy. [11]

Weber and Pastern [14] were the first who study the association of ABO blood group with periodontal disease. Kaslick *et al.* [15] studied the association of aggressive periodontitis and ABO blood group, they found significantly less patients with blood group O and more patients with blood group B.

Faser Roberts,[16] discussed the relationship between ABO blood group and susceptibility to chronic disease as an example of genetic basis for family predisposition. In India and Western countries, many workers have tried to find out the relationship between ABO blood group and various systemic diseases, and the results showed that some diseases like dental caries, [17]salivary gland tumors, [18]chicken pox, [19]malaria, [20]oral cancer, [21]hematological malignancies, [22] ischemic heart disease, [23] cholera, (etc., had significant association.

While in field of oral disease, Koregol *et al*. [24] in a study on 1220 subjects in South India concluded that blood group A formed a significantly higher percentage in the gingivitis group and blood group O formed a higher percentage in the periodontitis group. But,the blood group AB showed the least percentage of periodontal diseases. in general, less number of studies has been conducted to determine the relationship between ABO blood group and incidence of oral and dental diseases. Some researchers claimed that there was a relationship, whereas some others could not find any, which could be attributed to the geographic diversity in the population groups.

Obesity has been associated with many serious, life-threatening medical conditions, including cardiovascular disease [25] , various cancers[26] , and diabetes [27] as well as endocrine[28] and musculoskeletal diseases [29]. Central obesity is a risk factor for metabolic syndrome, a group of conditions or risk factors that increase a subject's risk for cardiovascular disease [30] .Being overweight or obese has also been associated with an increased risk for periodontal disease [31]. Periodontal disease is a common infectious disease associated with Gram-negative anaerobic bacteria, characterized by inflammation and destruction of periodontal tissues [32] .Obesity is one of the most important health problems worldwide. The prevalence of overweight and obesity in most developed and developing countries have been increasing markedly over the past two decades[33] .The association of obesity with increased morbidity and mortality is confirmed in several studies [34].Decrease in quality of life is one of substantial psychosocial consequences of obesity as well [35-37]. Obesity as a major risk factor of chronic non-communicable diseases is rising rapidly in developing countries. Understanding the risks for obesity is important for its control.

Some Studies have described an association between periodontal disease and obesity [38], increased body mass index (BMI) leading to increase appearance of oral disease[39], In addition, Shimazaki et al.[40] reported that metabolic syndrome increases the risk for periodontitis, some workers reported that increased levels of serum resist in , an adipokine secreted from adipose tissues, was significantly associated with periodontitis in a population of Japanese women [41].

Material and method

Subject ,A total of (82) subjects were selected randomly and collected from hospital of dentistry college of Al-mustansiria university between

February till July, 2013in the age group between (10-55)years of both the gender .All cases included in this study were non smokers ,non alcoholic and none use antibiotics, no pregnant and not suffering from systemic disease . All examined cases were classified to two groups as (42) individual (healthy group as control),(40)patient group include (22) case with gingivitis and (18)cases with periodontitis, dental examination were done by using mouth mirror, all details for each individual were collected include name, age ,gender ,use of antibiotics ,history of disease ,weight and height. then blood samples were collected by using a sterile disposable lancet and finger prick method by taken drops on glass slide then tested blood group and RH factor were done by using slide agglutination method (visual method) after obtaining the consent from each subject.

BMI: Is the ratio of weight in kilogram to height (in meter square. For both male &female, the degree of obesity is classified as:

-BMI between (20-24.9) normal or desirable weight range, BMI 25-29.9 low relative risk (over weight), BMI 30-40 moderate risk (moderate obesity) = grade I&II -BMI > 40 high risk (morbid obesity) grade III

The BMI was measured by, Height was measured and nearest 0.1 cm. weight was measured with a weight scale and recorded to the nearest0.01 kg. From these two measurements, the body mass index (weight in kilograms divided by height in meters squared) was calculated.

Statistical analysis

The Statistical Package for Social Science (SPSS) version 20 was used for data entry and analysis. Graphs and tables were used to describe the data and suitable statistical tests were used accordingly. Chi-Square test and Fisher's Exact Probability test, independent-sample T test, were used to test the association between dependent and independent variables.(P value <0.05 was considered significant) [(42)].

Result

Fig 1 and table 2 demonstrated a significant statistical differences between control and patient group regarding blood groups ,where the result showed that the blood group A represent 47.6 %from control group and blood group O represent 50%from oral disease group.(p value = 0.002).Statistical analyses by performing chi square test showed that there was no association between Rh factor either positive or negative between healthy control and patient groups(p value = 0.125) .

Table (3) and fig.2 ,demonstrated the frequency of different blood group in patient had have gingivitis and none ,the results reported that a non-significant differences between different blood groups and gingivitis statues (p value=0.513) .No statistical significant difference was found between Rh factors in one side and gingivitis statues in other side (p value =0.4).

Table 4 and fig.3 revealed that no statistical significant differences between blood groups and Rh from one side and periodontitis statues from other side (p value =0.5, 0.4) respectively .

Table 5 and 6 showed no statistical significant differences was found between blood groups and gender regarding gingivitis and periodontitis statues.(p value=>0.05)

The result (table 7and 8) shows a high statistical significant differences in BMI between control (22.71) lower than in patient group (26.79),also the result revealed that significant increase

BMI in perodonititis (28.15)compared with gingivitis statues (25.14) kg/m^2.

Discussion

The presence of microorganisms is a crucial factor in inflammatory periodontal disease, but the progression of disease is related to host-based risk factors. Indeed, the periodontal diseases are now recognized to be Eco genetic diseases, which highlight their multifactorial nature. [43] Genetic variations may act as protective or risk factors for certain conditions, including periodontitis. The genetic factors may alter the oral ecology and the process of periodontal disease. These data are suggestive of a broad correlation between periodontal diseases and blood groups, which may act as risk predictors for periodontal diseases. This will make it possible to better understand the risk factors of diseases of the periodontal tissues and to predict the effective methods of prevention and treatment of periodontal diseases.

The antigens of the ABO system are an integral part of the red cell membrane, which is also found in plasma and other body fluids. The presence or absence of certain antigens has been associated with various diseases and anomalies, with antigens also acting as receptors for infectious agents. [44 and45]

Periodontal disease is a multifactorial disease and the etiopathogenesis of the disease not been completely established yet, with a constitutional factor probably of genetic origin playing a part. The purpose of the study was to explore such a possibility and to correlate ABO blood group and periodontal status with severity of periodontal involvement. The distribution of ABO blood group in this similar to results of study of [8] and [24]study confirmed that different geographic locations show variations in the prevalence of A, B, AB, and O blood groups, as observed by Pradhanet al. [53]in their study. There was a statistically significant relationship between percentage distribution of A, B, AB, and O blood groups and periodontal status (groups I, II, and III) in our study, as shown in [Table 2]. When the percentage distribution of A, B, AB, and O blood groups and their distribution in oral disease group and healthy ,were studied [Table 3], it revealed interesting findings, which are that blood group O subjects followed by A in periodontal involvement and blood group A in healthy control group involvement. This finding was in agree to the observation made by Pradhanet al. where they reported that A blood group predominated in healthy periodontium and blood groups AB and O showed more inclination toward diseased periodontium. This observation differed from that of Pradhanet al. who reported a higher frequency of blood groups A and B in subjects with healthy periodontium as compared to those with diseased periodontium who showed a higher frequency of blood groups O and AB. There was a statistically significant relationship between frequency distribution of A, B, AB, and O blood groups and different study groups, as shown in [Table, 2,3].

In some studies reported that blood group A individuals have been reported to be more susceptible to gall stones, cholitis and tumors of salivary glands, [46]pancreas as well as ovary.[47],Cardiovascular diseases are more common in blood groups A, O and non-O. [48],[4]),[50],[51] Diabetes mellitus might be higher in subjects of blood groups A and O. [52] but these results disagree of present finding

In early study of Pradhan and his coworkers ,1971[53]It is suggested that

particular blood group and a tendency toward caries might be constitutional characters that were not particularly related to race, although the blood group O and good teeth were less common in civilized people than in primitive races. [53] while other study of Holbrook [54] and[55] Kornstad,2007 they reported that A high percentage of blood group O and low percentage of blood group A in caries immune group. In addition, denture wearers of blood group O were also found to be more susceptible to denture stomatitis.[56][57]Nikawa,1991and Gheisari,2008 they confirmed that maxillofacial deformities were the least with blood group A and were greater with blood group B, suggestive of ABO blood groups as one of the etiologic factors for these deformities. The available literature suggested a preliminary data in the quest for an association between ABO blood group, Rh factor and periodontal diseases. In a study of ABO blood typing and HLA antigens, the gingivitis subjects had a larger percentage of AB types and a smaller percentage of O types. Similarly, greater severity of periodontal diseases was noted in blood group O, but no association was found between secretor status and Localized Juvenile Periodontitis (LJP). [58][59]On the contrary, the aggressive periodontitis group showed a trend toward more blood groups A, B and a smaller percentage of O groups than the controls. [60]In this study, blood group O showed a highly significant distribution in gingivitis and group A in the control group. These findings points toward a possible genetic basis. As discussed in study of [53].

Also in study done by Demir*et al*.2009 found that different ABO blood groups may show significant differences in the rates of colonization of numbers of periodontal pathogens that are the main etiologic agents of periodontal diseases. [61]

This observation is different from the observation made by Pradhanet al.[53]19wherein they found apparently higher frequency of blood groups A and B with mild periodontal involvement (grades 0 and I) and blood groups O and AB showed higher frequency in subjects with moderate to severe periodontal involvement (grades II, III,and IV combined). Finally, this study recorded that prevalence of gingivitis in blood group O patients and in healthy group significantly increase blood group A. The blood group AB showed the least prevalence of periodontal diseases. These data are suggestive of a correlation between periodontal diseases and blood groups, which may act as risk predictors for periodontal diseases. Genetic differences in immune cell development and antigen presentation may contribute to the susceptibility to infectious diseases. These variations in their results may be because the study subjects were medical students of younger age group (17-25 years), and were of higher socioeconomic status with awareness of oral hygiene habits and possibility of dental visits in the childhood or prior to the commencement of the study, while our study comprised randomly selected subjects of the age group 10-55 years and patients attending outpatient department of our college and these patients had no history of periodontal treatment in the past. In the present study and various other studies that reported on ABO blood group and most oral disease, a difference is found in the percentage and frequency distribution of A, B, AB, and O blood group in different periodontal status. It is very difficult to elaborate a hypothesis on why subjects with particular blood group are found in increased frequency in healthy,

gingivitis, and periodontitis groups, and also in various grades of periodontal involvement. However, occurrence of gingivitis and periodontitis is the result of many factors and the probable genetic influence demonstrates a small facet of multifactorial etiology of this disease. Since most of these studies are carried out on a small group of subjects, until universal figures are made available, the decision as to whether a particular blood group has a particular immunity or susceptibility should be put off. Until then, all In this study showed that the body mass index was significantly higher in the patient with oral disease groups compared to the control healthy group (26.49 and 22.71respectively). It is difficult to explain this finding, but it might be related to protein deficiency. Muscles are made primarily from proteins. Protein deprivation has been shown to cause changes in the periodontium of experimental animals [(62)] .The following observations have been made in protein-deprived animals: degeneration of the connective tissue of the gingiva and periodontal ligament, osteoporosis of alveolar hone, impaired deposition of cementum, delayed wound healing, and atrophy of the tongue epithelium. Similar changes occur in the periosteum and bone in other non oral areas, generally the poor oral health has previously been related to high body mass index (BMI).

Recommendations: this study suggested for each individual must determine the blood group to make it possible to better understand the risk factors of oral disease and to predict the effective methods of prevention and treatment of periodontal diseases. As well as, recommended to decrease the body weight to avoid the progress of disease .

Conclusion

The genetic factors may alter oral ecology and the process of periodontal diseases. Genetic differences in immune cell development and antigen presentation may contribute to the susceptibility to infectious diseases from the findings of this study reports of preponderances should be accepted with a pinch of salt.

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Results (Tables and Figutes)

Table 1- Distribution of study groups according to age groups and gender.

Study variables		Patients		control		Chi square	p-value
		No=40	%	No=42	%		
Age groups(year)	10-19	6	54.5	5	45.5	2.469	0.4
	20-29	20	41.7	28	58.3		
	30-39	8	61.5	5	38.5		
	more 40	6	60.0	4	40.0		
Gender	F	22	52.4	20	47.6	0.447	0.5
	M	18	45.0	22	55.0		

Table 2A-Distribution of study groups according to blood groups and Rh factor.

Variables		Patients n=40			Control=42			X^2	p-value
		No	Row %	Column %	No	Row %	Column %		
Blood groups	A	10	33.3	25.0	20	66.7	47.6	14.678	0.002
	AB	3	23.1	7.5	10	76.9	23.8		
	B	7	53.8	17.5	6	46.2	14.3		
	O	20	76.9	50.0	6	23.1	14.3		

B

Study parameters		Patient / control					
		Patient		control			
		No	%	No	%	X^2	P value
Rh-Factor	Negative	3	27.3	8	72.7%	2.352	0.125
	Positive	37	52.1	34	47.9%		

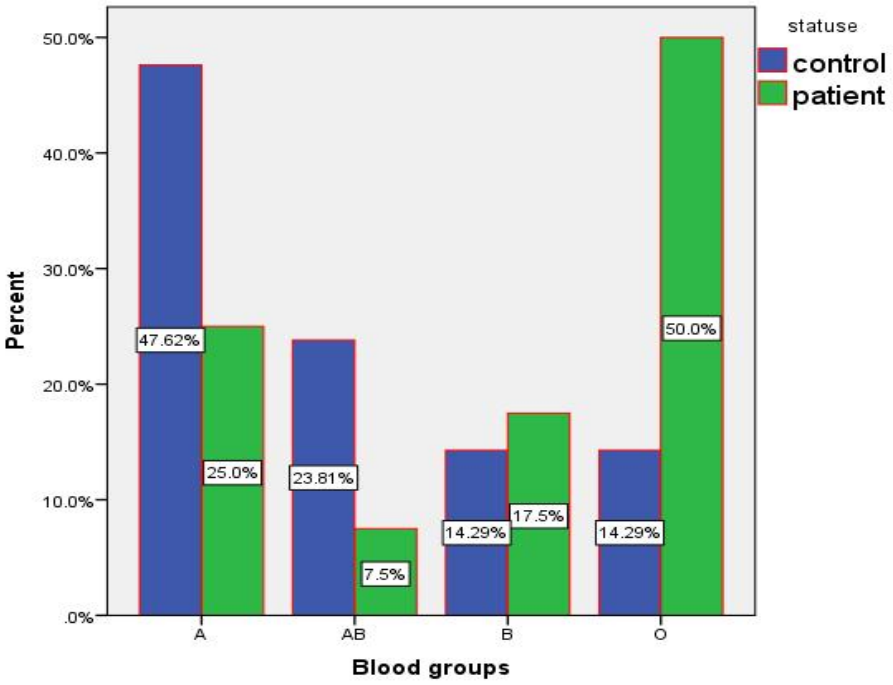

Fig (1): Distribution of study groups according to blood group...

Table- 3A -Distribution of study parameters according to present or absent of gingivitis

Variables		Gingivitis							
		Yes			No				
		N=22	Row N%	Column %	N=18	Row %	Column %	X^2	P value
Blood group	A	4	40.0	18.2	6	60.0	33.3	2.299	o.5
	AB	2	66.7	9.1	1	33.3	5.6		
	B	3	42.9	13.6	4	57.1	22.2		
	O	13	65.0	59.1	7	35.0	38.9		

.B

Study parameters		Gingivitis				X^2	p-value
		Negative		Positive			
		No	%	NO	%		
Rh-Factor	Negative	2	66.7	1	33.3	0.615	0.433
	Positive	16	43.2	21	56.8		

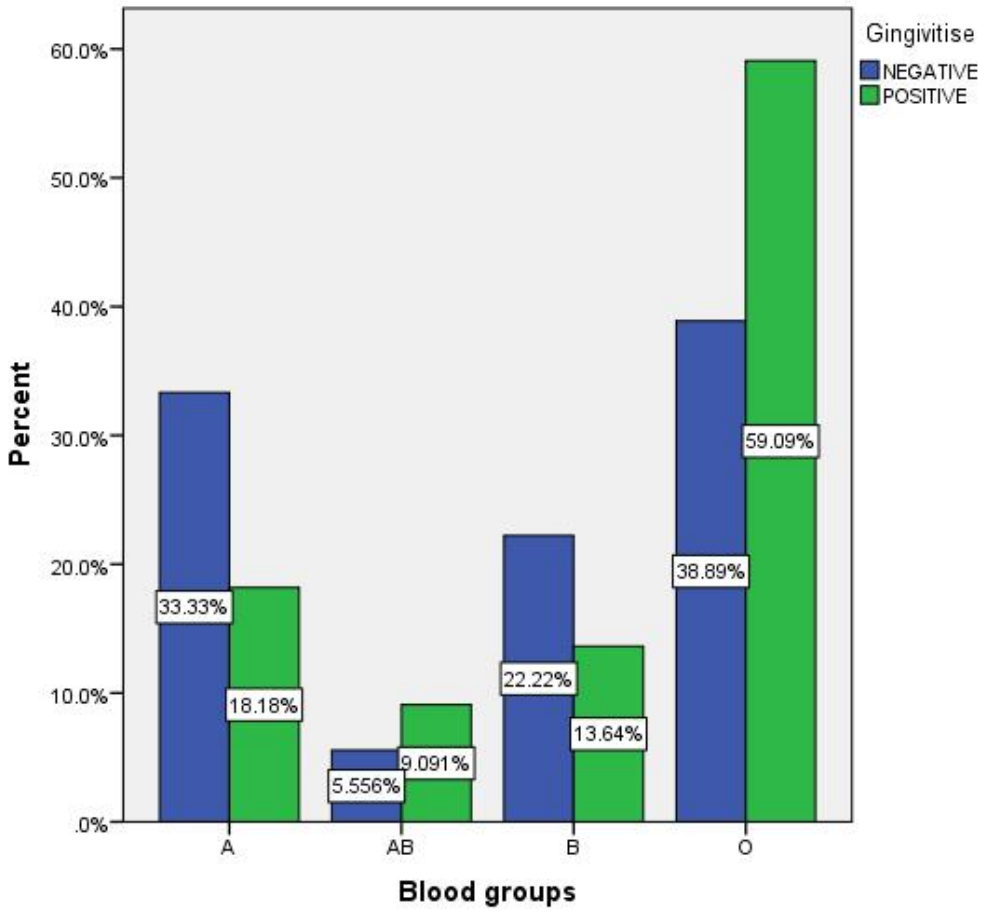

Fig.(2):- Distribution of blood groups among patient group with gingivitis

Table(4)-A:- Distribution of study parameters according to present or absent of periodontitis.

Study Variables		Periodontitis							
		Yes			No				
		No=18	Row %	Column %	No= 22	Row %	Column %	X^2	p-value
Blood group	A	6	60.0	33.3	4	40.0	18.2	2.299	0.5
	AB	1	33.3	5.6	2	66.7	9.1		
	B	4	57.1	22.2	3	42.9	13.6		
	O	7	35.0	38.9	13	65.0	59.1		
	-ve	2	66.7	11.1	1	33.3	4.5		

B

Study parameters		Periodontitis					
		Negative		Positive			
		No	%	No	%	X^2	P value
Rh-Factor	Negative	1	33.3	2	66.7	0.615	0 .43
	Positive	21	56.8	16	43.2		

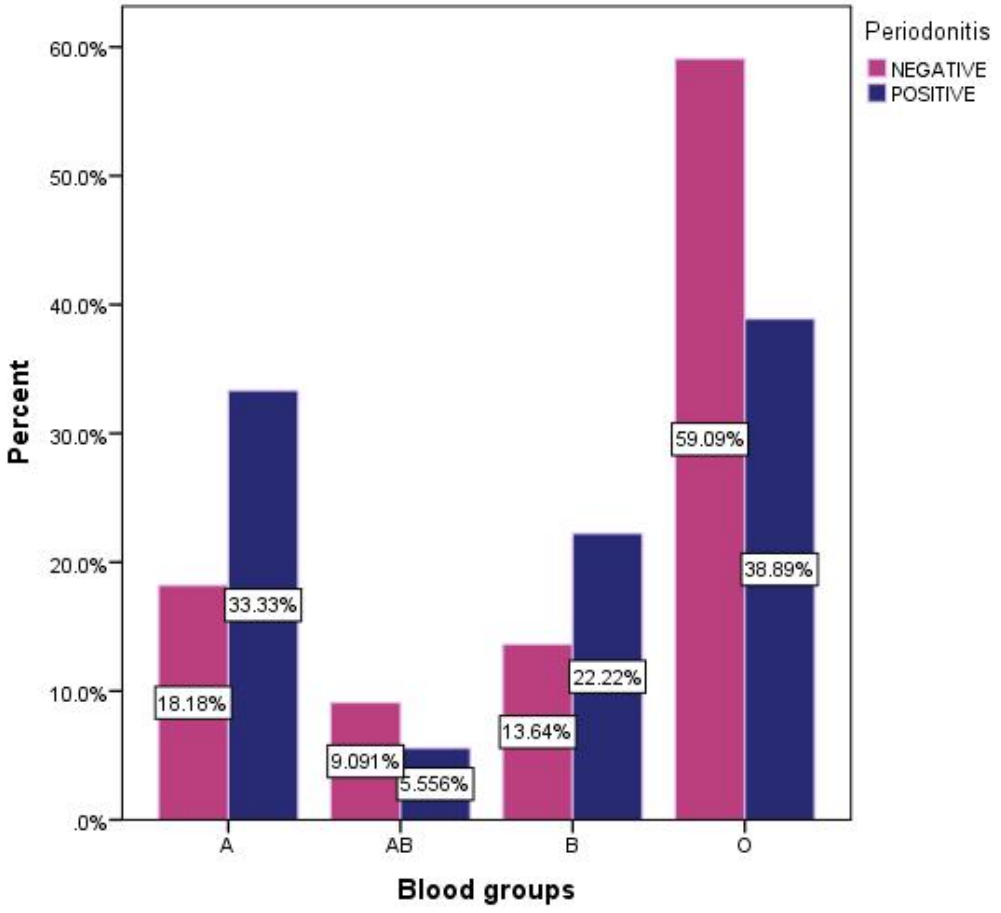

Fig.(3) Distribution of blood groups among patient group with peridonititis

Table (5):- Distribution of cases accords to gender and gingivitis statues.

Blood groups and Gender		Gingivitis					
		NO		YES			
		NO=18	%	NO=22	%	X^2	P value
A	F	5	83.3	1	16.7	3.403	0.06
	M	1	25.0	3	75.0		
AB	F	0	0.0	1	100.0	0.750	0.3
	M	1	50.0	1	50.0		
B	F	1	33.3	2	66.7	1.215	0.2
	M	3	75.0	1	25.0		
O	F	6	50.0	6	50.0	2.967	0.08
	M	1	12.5	7	87.5		

Table (6):- Distribution of cases according to gender and periodontitis statues.

Blood group and gender		Periodontics					
		Yes		No			
		no	Row N%	No	Row %	X^2	p-value
A	F	5	83.3	1	16.7	3.403	0.06
	M	1	25.0	3	75.0		
AB	F	0	0.0	1	100.0	0.750	0.3
	M	1	50.0	1	50.0		
B	F	1	33.3	2	66.7	1.215	0.2
	M	3	75.0	1	25.0		
O	F	6	50.0	6	50.0	2.967	0.08
	M	1	12.5	7	87.5		

Table (7) Distribution of study groups according to BMI.

BMI and study groups	N	Mean of BMI	Std. Deviation	Std. Error Mean	T TEST	P VALUE
Patients	40	26.49	3.056	0.483	5.426	0.001
Control	42	22.71	3.241	0.500		

BMI=Body mass index

Table (8) Distribution of oral disease groups according to BMI.

Gingivitis		NO.	Mean of BMI	Std. Deviation	T TEST	P VALUE
BMI	Yes	22	25.14	2.696	-3.530	0.001
	No	18	28.15	2.675		
	Periodontics					
BMI	Yes	18	28.15	2.675	3.530	0.001
	No	22	25.14	2.696		