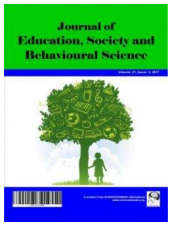

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Association between ABO Blood Group Phenotype and Reaction to Academic Stress and Coping Strategies among College Students

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Proper stress response and use of ideal coping strategy can reduce stress-related poor academic performance and ill health among college students. However, whether individual's stress response/coping method is related to the blood type has not been empirically examined.
Objectives: Given this, this study examined the relationship between ABO blood type and reaction to academic stress and coping strategies among college students in Southern Nigeria.
Methods: A cross-sectional study was conducted on 319 (142 male and 177 female) students. They were examined using Perceived stress scale-10 (PSS-10) which measures stress level. Reaction to stress and coping strategy questionnaires (CSQ) were used to measure four types of stress reactions and coping methods.
Results: Prevalence of perceived stress was 79.6%. Most of the stressed participants (46.5%) were of blood group O. Most prevalent reactions to stress versus (vs) coping methods according to blood type were emotional (99.3%) vs religious (95.0%), emotional (88.4%) vs active distracting (90.9%), behavioral (82.5%) vs active practical (95.0%), and physiological (91.5%) vs active distracting (98.3%), for blood groups A, B, AB and O respectively. Compared to those with blood

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group A, participants with blood groups B and AB had higher odds of emotional reaction to stress (Odds Ratios (ORs); 2.13, (95% Confidence intervals (CI):1.459-2.799) and 1.47(95% CI: 0.555-3.871) respectively. ORs and CIs for cognitive reaction were 5.68(1.866-36.486) and 1.71(0.429-6.773) for blood groups B and AB respectively. For behavioral reaction, ORs and CIs were 1.25(0.494-3.174), 2.08(1.684-6.309) and 1.54(0.575-4.09) for blood groups B, AB and O respectively, while ORs and CIs for physiological reaction was 2.75(1.302-10.877) for blood group O. Active practical, active distracting, religious and active practical coping methods were mostly used by individuals with blood groups A, AB, B and O respectively.

Conclusion: There is a relationship between individuals' ABO blood type and the risk of being stressed, type of stress response and coping methods employed to combat stress. Interventions to reduce stress and associated disorders should among other factors consider individuals' blood group.

Keywords: ABO blood phenotype; stress; reaction; coping; student.

1. INTRODUCTION

Stress is universal and inevitable part of life created by excessive environmental and internal demands. It needs to be adequately responded to and coped with to avoid the associated adverse health effects which are enormous and debilitating. Although every one experiences stress as a result of normal daily activities, prior studies have shown a unique stress response among individual to combat the perceived stress-imposed threat. Each person has a different reaction and coping strategy to his or her stress. Stress response is part of the homeostatic balance and is necessary for evolution and survival. Dysfunction of stress response system leads to poor physical, metabolic and physiological endpoints and consequently, to several diseases including diabetes mellitus [1], peptic ulcer [2], obesity [3], sleep disorders, hypertension [4], ischaemic heart disease [5], osteoporosis [6], reduced mental alertness, increased anxiety, risk of depression, poor academic performance and several cancers. Interestingly, people and groups differ in sensitivity and vulnerability to these stress-induced disorders probably due to differences in their interpretation, reaction and coping strategies adopted to combat stressors [7].

The central nervous system may response to stressful situation by altering the endocrine, neural and/or immune activities. However, the pattern of biological response depends on the situation. Even so, there are individual differences in stress response to similar situation [8]. This inherent stress adaptive ability has been shown to have some genetic predisposition [9] and thus, largely depends on our body's natural biochemical response which is determined by our deoxyribonucleic acid (DNA). The composition of our ABO blood type is determined by the inheritance of gene on chromosome 9(9q34) [10]. Interestingly, the same DNA locus (9q34) that determines our blood type also controls our response to stress. Previous studies had attempted to establish a link between individuals' blood type and personality trait with no scientific consensus, however recent evidence implicates the role of a catecholamine metabolizing enzyme (dopamine beta hydroxylase (DBH)) which is known to be involved in the metabolism of dopamine into norepinephrine. It is now known that ABO/DBH linkage exists that determine the dopamine: norepinephrine ratio that influences individual's behavior [11,9].

It is posited that our blood type is important with regards to the type and concentration of these stress hormones, their resting levels, the way we respond to stress, how quickly these level revert back after stress. In the university environment, students are continuously exposed to high level of stress which may be academic or self imposed kind of stressors or both. These may include psychosocial, physical or individual stressors, and they must respond to it on a daily basis [7], though differently [12].

Whether the response pattern has any relationship with individual's blood group phenotype has not been investigated. Understanding the ABO group phenotypic correlate of stress, stress response and coping strategy may suggest genetic related risk factors that increase individual's susceptibility to stress and predicts ideal stress response and coping methods to reduce the risk of stress-related diseases. Therefore, the aim of this study was to assess the relationship between ABO blood group phenotype and reaction to academic stress and coping strategies among undergraduates in a Nigerian University.

2. SUBJECTS AND METHODS

This cross-sectional study was conducted between the month of March and October, 2018 in a Nigerian University. Students were invited to participate in the survey through several media including announcement during lecture and practical classes. Participation was free and voluntary. Of the initial 528 students who responded to the invitation, 319 (142 male and 177 female) undergraduates from different faculties in the university met the inclusion criteria and were assessed. This number represented 60.42% of the initial number invited to participate. Others (39.58%) were excluded for not meeting the inclusion criteria.

The exclusion criteria were inappropriate age (<18years), missing data, decline participation, inadequate completion of questionnaire, and poor mental status.

All participants signed written informed consent and the study protocol was approved by the Institutional Research Ethics Committee.

2.1 Instruments of Survey/Assessment Measures

Two survey instruments were used in this study, including a 4-section semi structured questionnaire which assessed the demographic characteristics of participants, stress level, reaction to stress and coping strategies employed by the participants and determination of ABO blood group phenotype. The questionnaire was adapted from previous studies with similar hypothesis [13-17].

Part A of the questionnaire recorded the socio-demographic characteristics of participants including age (years), gender, marital status, year of study and faculty of study.

Part B of the questionnaire consisted of items adapted from Perceived Stress Scale-10 (PSS-10) and Student-life Stress Inventory (SLSI), and measures perceived stress, reaction to stress and coping methods used by respondents as described elsewhere [13,14]. Briefly, participants were asked to respond to each question on a five point scale ranging from 0 (never), to 4 (very often). Scores ranged from 0-40 with higher scores indicative of higher stress. A score of ≥ 20 was suggestive of high stress level.

Reaction sub-scale consisted of 28 items and measures four categories of reactions to stressors (physiological, 14 items, emotional, 4 items, behavioral, 8 items and cognitive, 2 items). The reaction sub-scale was assessed on a 4-point scale (i.e., 1=never, 2=occasionally, 3=often, 4=most of the times) and dichotomized (1and2 vs 3 and 4). It was summed to produce total scores ranging from 1-14 for physiological reaction, 1-4, 1-8 and 1-2 for emotional, behavioral, and cognitive reactions respectively. Low versus (vs) high reactions were 1-7 vs 8-14, 1-5 vs 6-8, 1 vs 2 for physiological, behavioral, and cognitive reactions respectively.

The coping strategy sub-section consisted of 63 items and measures 4-types of coping including active practical, active distracting, avoidance and religious coping methods. This section was assessed on a 5-point scale (i.e., 1=never, 2=seldom, 3=occasionally, 4=often, and 5=most of the time). None, low and high usages of a specific coping method were represented by scores of 1, 2-3 and ≥ 4 respectively.

Blood samples were obtained from all participants through a finger prick with a sterile disposable lancet. Anti-A, anti-B and anti-D monoclonal blood group reagents were used to determine participants' ABO blood group phenotype by slide agglutination method.

3. RESULTS

The socio-demographic variables of 319 undergraduates who participated in this survey revealed that 254 (79.6%) participants were stressed, while 65 (20.4%) were not stressed. In addition, 177 (55.5%) were females while 142 (44.5%) were males. Other demographic variables (age, level of study and faculty of study) showed no significant difference between the stressed and not stressed participants with the exception of marital status which significantly ($P<0.05$) differed between the two groups (Table 1).

Table 2 shows the distribution of stress by blood group as follows; 74 (29.1%), 22 (8.7%), 40 (15.7%) and 118 (46.5%) for blood groups A, B, AB and O respectively. The highest prevalence of stress was found among individuals with blood group O, followed by blood groups A, AB and B.

Fig. 1 shows that most participants with blood group A showed emotional reaction 72 (97.37%), followed by behavioral 51 (68.9%) and physiological 38 (51.4%) reactions to academic stressors. Majority of those with blood group B

19 (86.4%) displayed emotional reaction followed by behavioral 13 (59.1%) and physiological 12 (54.5%) reactions to stress. A greater number of participants with blood group AB showed behavioral 33 (82.5%) reaction followed by cognitive, 30 (75%) and physiological reactions to stress. Blood group O individuals mostly reacted physiologically 108 (91.5%) followed by behavioral 76 (64.4%) and cognitive reaction 56 (47.5%).

Furthermore, majority 69 (93.2%) of participants in group A blood adopted religious mode of coping with stress, blood group B 20 (90.9%) made use of distracting coping strategy while blood group AB 38 (95.0%) employed practical coping strategy. Similarly, most 116 (98.3%) participants with blood group O adopted distracting coping method. Interestingly, it was further observed that although there was a slight variation in the use of practical, distracting, religious coping methods within each of the blood group phenotype, there were no significant differences in the number of respondents who employed these coping strategies to cope with academic stressors Fig. 2.

Table 3 shows that the odds of being stressed when faced with stressful situation were higher among individuals with blood group B. Individuals with blood group B have the highest likelihood of reacting cognitively (OR:5.86, CI:1.866-36.486, P=0.006), followed by emotional reaction (OR:2.13, CI: 1.459-2.799, P=0.007) and behavioral reaction (OR:1.25, CI:0.494-3.174, P=0.635) and less likelihood of reacting physiological (OR:0.88, CI:0.338-2.286, P=0.792).

Table 1. Socio-demographic characteristics of the respondents

Variables	With stress (n=254)	Without stress (n=65)	Total (n=319)	p-value
Sex				
Male	108(42.5)	34(52.3)	142(44.5)	0.202
Female	146(57.5)	31(47.7)	177(55.5)	
Age (Years)				
16-19	39(15.4)	12(18.5)	51(16.0)	
20-25	170(66.9)	47(72.3)	217(68.0)	0.385
26-30	33(13.0)	5(7.7)	38(11.9)	
31 and above	12(4.7)	1(1.5)	13(4.1)	
Marital Status				
Single	211(83.1)	64(98.5)	275(86.2)	
Married	35(13.8)	1(1.5)	36(11.3)	0.016*
Divorced/Separated	4(1.6)	0(0.0)	4(1.3)	
Widowed	4(1.6)	0(0.0)	4(1.3)	
Level of Study				
100L	41(16.1)	9(13.8)	50(15.7)	
200L	53(20.9)	17(26.2)	70(21.9)	
300L	50(19.7)	19(29.2)	69(21.6)	0.165
400L	71(28.0)	17(26.2)	88(27.6)	
500L	22(8.7)	1(1.5)	23(7.2)	
600L	17(6.7)	2(3.1)	19(6.0)	
Faculty				
Arts	50(19.7)	18(27.7)	68(21.3)	
Engineering	36(14.2)	11(16.9)	47(14.7)	
Environmental	15(5.9)	7(10.8)	22(6.9)	
Law	3(1.2)	3(4.6)	6(1.9)	
Pharmacy	19(7.5)	0(0.0)	19(6.0)	
Science	32(12.6)	7(10.8)	39(12.2)	0.255
Social Science	14(5.5)	3(4.6)	17(5.3)	
Basic Medical	19(7.5)	3(4.6)	22(6.9)	
Education	12(4.7)	3(4.6)	15(4.7)	
Clinical Science	20(7.9)	3(4.6)	23(7.2)	
Business Administration	18(7.1)	4(6.2)	22(6.9)	
Agriculture	16(6.3)	3(4.6)	19(6.0)	

**significant at 5% (p<0.05)*

Individuals in blood group AB had higher likelihood of exhibiting behavioral reaction (OR:2.08, CI:0.266-2.141, P=0.754), cognitive (OR:1.71, CI:0.429-6.773, P=0.448) and emotional (OR:1.47, CI:0.555-3.873, P=0.439) and less likelihood of reacting physiologically (OR:0.754, CI:0.266-2.141, P=0.754). Blood group O individuals have increased likelihood of exhibiting physiological reaction (OR:2.75, CI:1.302-10.877, P=0.042) followed by behavioral reaction (OR:1.54, CI:0.575-4.09, P=392) and less likelihood of exhibiting emotional and cognitive reactions (Table 4).

Table 5 shows that participants with blood group AB had the highest likelihood of using active practical coping method followed by individuals of blood groups O and A. Also, the odds of using active distracting coping method was highest in participants with blood group B followed by participants with blood groups AB and O. Religious coping method was mainly practiced

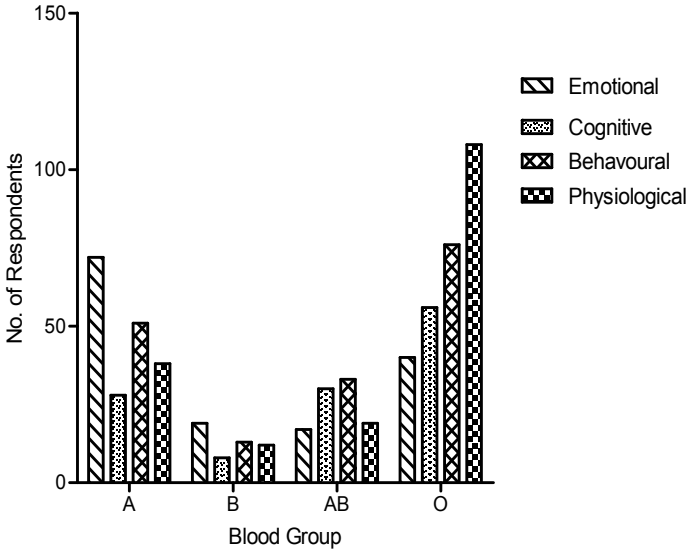

Fig. 1. Distribution of reaction to stress by blood group phenotype

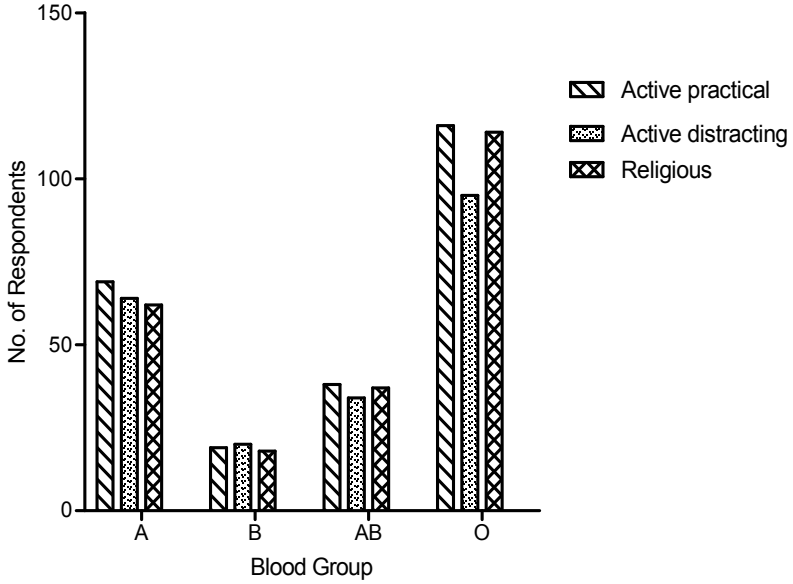

Fig. 2. Distribution of coping strategies by blood group phenotype

Table 2. Distribution of academic stress by blood group phenotype of the respondents

Blood phenotype	Stress (n=254)	Not Stress (n=65)	Total (n=254)	Chi-square statistic	p-value
A	74(29.1)	20(30.8)	94(29.5)	0.467	0.926^{NS}
B	22(8.7)	5(7.7)	27(8.5)		
AB	40(15.7)	12(18.5)	52(16.3)		
O	118(46.5)	28(43.1)	146(45.8)		

NS= not significant at 5% (p>0.05)

Table 3. Logistic regression showing association between stress and blood phenotype

Variable	B	S.E	Wald	OR(95% C.I)	p-value
Blood phenotype			1.491		
A	-	-		1.00(reference)	0.684
B	-0.155	0.577	0.07	1.17[0.377 - 3.623]	0.788
AB	-0.189	0.584	0.11	0.83[0.264 – 2.598]	0.746
O	-0.262	0.631	0.172	0.77[0.223 – 2.652]	0.679

Adjusted for socio-demographics of the respondents

Table 4. Logistic regression showing association between reaction to academic stress and blood phenotype

Reaction to stress	Blood group	OR unadjusted (95% C.1)	p-value
Emotional reaction	A	1.00 (reference)	
	B	2.13[1.459 – 2.799]	0.007**
	AB	1.47[0.555 – 3.873]	0.439
	O	0.95[0.397 – 2.271]	0.786
Cognitive reaction	A	1.00 (reference)	
	B	5.68[1.866 – 36.486]	0.006**
	AB	1.71[0.429 – 6.773]	0.448
	O	0.74[0.172 – 3.223]	0.693
Behavioral reaction	A	1.00 (reference)	
	B	1.25[0.494 – 3.174]	0.635
	AB	2.08[1.684 – 6.309]	0.019*
	O	1.54[0.575 – 4.09]	392
Physiological reaction	A	1.00 (reference)	
	B	0.88[0.338 – 2.286]	0.792
	AB	0.754[0.266 – 2.141]	0.754
	O	2.75[1.302 – 10.877]	0.042*

Adjusted for Socio-demographics characteristics.
**Significant at 5% (p<0.05),*
***Significant at 1% (p<0.01)*

by individuals of blood groups B and AB, and less likely practiced by individuals of blood group O.

4. DISCUSSION

The results of this study showed that undertaking a university education is a highly stressful venture, and how this stress is perceived, responded to, and coped with could be influenced by individual's blood type. Evidence for this notion is twofold; first, similar to the results of the present study, previous investigators have consistently recorded high prevalence of stress among college students. Here we found that 79.6% of students were stressed. In a similar study at the University of Calabar, Oku et al. [18] reported 94.2% prevalence of stress among undergraduate students. In 2015, Melaku [19] reported 52.4% prevalence of stress among college students in Ethiopia. Likewise studies in other populations [20-26] have demonstrated similar high frequency of stress among college students, although variations in frequency across population have been observed, likely due to the notion of individual and ethnic diversity in stress perception.

Table 5. Logistic regression and 95% confidence interval showing relationship between blood phenotype and coping strategies

Coping strategies	Blood phenotype	OR (95% C.1)	p-value
Practical coping	A	1.00 (reference)	
	B	1.25[0.321 – 4.113]	0.632
	AB	2.28[1.011 – 6.885]	0.032*
	O	1.41[0.933 – 10.892]	0.632
Distracting coping	A	1.00 (reference)	
	B	3.22[1.282 – 10.882]	0.036*
	AB	2.12[0.952 - 6.683]	0.583
	O	1.20[0.833 – 4.021]	0.933
Religious coping	A	1.00 (reference)	
	B	1.95[1.358 – 10.588]	0.044*
	AB	1.82[1.252 – 4.049]	0.049*
	O	0.95[0.178 – 2.393]	0.519

Adjusted for socio-demographics characteristics.
**Significant at 5% (p<0.05),*
***Significant at 1% (p<0.01)*

Second, perceived stress was more prevalent (46.5%) among individuals with blood group O compared with other blood groups. This is consistent with the findings of Chaudhuri et al. [27] in a similar study in eastern India. In this study, perceived stress score was significantly higher in group O compared to group A individuals, as observed in the present study. This observation is despite the fact that individuals of blood group O have higher threshold limit for stress than individuals of blood group A. They secrete less stress hormones (Cortisol and adrenaline) and hence less likelihood of being stressed compared with blood group A individuals known to secrete high levels of these stress hormones, and consequently have higher tendency for stress.

A plausible explanation for this observation is partly due to the fact that blood group O is the most prevalent blood group in the general population of Nigeria and elsewhere. The preponderance of blood group O over other blood groups have been reported in several studies conducted in different parts of Nigeria and elsewhere, although with varying frequencies likely due to the underlying genetic and ethnic diversity of human populations [10, 28]. For instance, in a recent review to establish a reference data base on the distribution of ABO and Rh blood groups from studies conducted in different parts of Nigeria, Anifowoshe et al. [10] reported a consistent pattern of blood group O preponderance (52.93%). In a retrospective study among blood donors in Sokoto, Nigeria, Musa et al. [29] recorded a consistent pattern of blood group O predominance in 51.91% of the participants. Medugu et al. [30] found that 47.7% of pregnant women in Yola, Adamawa state, Nigeria were of blood group O. Likewise Hassan et al. [31] reported the prevalence of 49.2% for blood group O in a 5 year retrospective survey of ABO blood group distribution among blood donors in Ahmadu Bello University Teaching Hospital, Kaduna, Nigeria.

A similar multi-race/ethnic study in United State reported a consistent pattern of blood group O preponderance [28]. Therefore, individuals of blood group O constituting the largest proportion of stressed participants could partly be corollary of the higher prevalence of blood group O in the general population of Nigeria. Also, there is delayed release of stress hormones (cortisol and catecholamines) following stressful encounter in individuals of blood group O, however, when released, the metabolism of these hormones is delayed because the enzyme of monoamine oxidase (MAO) which is working among others to enhance the metabolism of catecholamines such as adrenaline and nor-adrenaline is less active in platelets of blood group O individuals. Therefore, stress episodes/effects tend to be more sustained in individuals with blood group O than those with blood group A. Group A individuals respond to stress by releasing a large amount of adrenaline, which is also eliminated quickly to reduce the effect of stress.

Physiological reaction to stress was more prevalent in blood group O than A, while emotional was more prevalent in blood group A than O. The most common physiological reactions among blood group O individuals were feeling of un-coordination, headache, lower back pain, sweating and chills, stomach upset and changes in appetite, probably due to the effect of the secreted catecholamines. The behavioral and emotional reactions also observed in some group O individuals may be due to the longer time of stress in these individuals which is associated with exhaustion, and subsequently to anger and aggression. Most prevalent reports were the feeling of fear, guilt, apathy and decreased efficiency and effectiveness. Common coping strategies adopted by these individuals were religious, active practical and active distracting. Some of them used reading of bible, meditation, praying for guidance to cope with their stresses. Others watched movies, involved in physical activities or embarked on a short visit to friends.

Blood group A individuals reacted mostly emotionally, behaviorally and physiologically to stress, and least of cognitive reaction. Most participants in this group agreed that they forget things easily. They have limited attention span and difficulty in concentrating. Some of them reported having problem with sleep and are easily annoyed. Few others suffered from headache and poor appetite. Group A individuals employed mainly active practical, active distracting and religious coping methods to lessen their stress levels. They naturally have a higher serum cortisol level than other blood groups, and when stressed, serum level of adrenaline rises more than in other blood groups. They are designated as the worst group in reducing their stress levels. Blood group B displayed marked emotional and moderate behavioral and physiological reactions to stress. They employed mostly active distracting, active practical and religious methods to allay their stresses. They naturally have large amount of cortisol and release more adrenaline during stress although not as much as blood group A individuals. However, blood levels of these stress hormones are reduced immediately, thereby enhancing faster recovery from stressful encounter similar to blood group A.

Individuals with blood group AB showed marked behavioral and cognitive reaction to stress and employed mainly practical, religious and distracting coping strategies to manage their stresses and reduce stress hormone slowly almost similar to blood group O. This study has few limitations especially those related to the cross-sectional nature of the study design. Also, uneven distribution of different blood groups among study participants and self reporting bias should be considered in the interpretation of results.

5. CONCLUSION

There is a correlation between individual's blood type and the odds of being stressed, reaction to stress and coping strategy employed to cope with stress.

CONSENT AND ETHICAL APPROVAL

All participants signed written informed consent and the study protocol was approved by the Institutional Research Ethics Committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Waseem AG, Iqba IM, Khan OA, Tahir M. Association of diabetes mellitus with ABO and Rh blood groups. Ann. Pak. Med. Sci. 2012;8(2):134-136.
2. Edgren G, Hjalgrim H, Rostgaard K, Norda R, Wikman A, Melbye M, Nyren O. Risk of gastric cancer and peptic ulcers in relation to ABO blood type: A cohort study. Am. J. Epidemiol. 2010;172:1280-1285.
3. Suadicani P, Hein HO, Gyntelberg F. Airborn occupational exposure, ABO phenotype, and risk of obesity. Int. J Obes. 2005;29:689-696.
4. Wafi NAR. Blood groups and hypertension. J. Bagh Coll Dentistry. 2006;18(2)68-70.
5. Whincup PH, Cook DG, Phillips AN, Shaper AG. ABO blood group and Ischaemic heart disease in British men BJM. 1990;3000:1679-1682.
6. Choi JW, Pai SH. Association between ABO blood groups and Osteoporosis in postmonopausal women. Ann. Clin. and Lab Sci. 2004;34(2):150-153.
7. Hamaideh SH. Gender differences in stressors among Jordanian University students. Int. J. of Social Psychiatry. 2012; 58(1):26-33.

8. Schneiderman N, Ironson G, Siegel SD. Stress and health: Physiological, behavior, and biological determinants. Annu Rev Clin Psychol. 2005;1:607-628.
9. Hobgood DK. ABO group B is associated with personality traits through linkage disequilibrium with low activity dopamine beta hydroxylase. Hypothesis in the Life Science. 2011;1(1):1-8.
10. Anifowoshe AT, Owolodun OA, Akinseye KM, Iyiola OA, Oyeyemi BF. Gen frequencies of ABO and Rh blood groups in Nigeria: A review. The Egyptian Journal of Medical Human Genetics. 2017;18:205-210.
11. Wilson AF, Elston RC, Siervogel RM, Tran LD. Linkage of a gene regulating dopamine-beta-hydroxylase activity and the ABO group locus. Am J Hum Genet. 1988;42(1):160-166.
12. Gadzella B. College students assess their stressor and reaction to stressors. Paper presented at Taxes A and M University assessment conference, TX; 2004.
13. Ragaa EM, Seba MG, Randah MH, Ahmed MA, Tarek S. Perceived s and burnout among medical students during the clinical period of their education. Ibnosina J Med BS. 2013;5(4):179-188.
14. Gadzella BM, Fullwood HL, Ginther DW. Student-life Stress Inventory, 1991. Paper presented at Texas Psychological Association Convention San Antonio, TX (ERIC 350-345).
15. Gadzella B, Catharine C. Stress difference among university female students. American Journal of Psychological Research. 2006;2:(1):21-27.
16. Kausar R. Cognitive appraisal coping and psychological distress in carers of physically disabled people in Pakistan. Journal of Behavioral Sciences. 2001; 2(1-2):47-68.
17. Kausar R. Perceived Stress, Academic Workloads and use of coping strategies by University students. Journal of Behavioral Sciences. 2010;20:31-36.
18. Oku AO, Owoaje ET, Oku OO, Ikpeme BM. Prevalence of stress, stressors and coping strategies among medical students in a Nigerian Medical School. Afri. J. Med. Health Sci. 2015;14:29-34.
19. Melaku L, Mossie A, Negash A. Stress among medical students and its association with substance use and academic performance. Journal of Biomedical Education; 2015.
    Available:http://dx.doi.org/10.1155/2015/149509
20. Loureiro E, McIntyre T, Mota-Cardoso R, Ferreira MA. The relationship between stress and life-style of students at the Faculty of Medicine of Oporto. Acta Medica Port. 2008;21:209–14.
21. Shah M, Hasan S, Malik S, Sreeramareddy CT. Perceived stress, sources and severity of stress among medical undergraduates in a Pakistani medical school. BMC Med Educ. 2010; 10:2.
    DIO: 10:1186/1472-6920-10-2
22. Sohail N. Stress and academic performance among medical students. J Coll Physicians Surg Pak. 2013;23:67–71.
23. Kulsoom B, Afsar NA. Stress, anxiety, and depression among medical students in a multiethnic setting. Neuropsychiatr Dis Treat. 2015;11:1713–22.
24. Youssef FF. Medical student stress, burnout and depression in Trinidad and Tobago. Acad Psychiatry. 2016;40:69–75.
25. Rasheed FA, Nagvi AA, Ahmad R, Ahmad N. Academic stress and prevalence of stress-related self-medication among undergraduate female students of health and non-health cluster colleges of a public sector university in Dammam, Saudi Arabia. J. Pharm. Bioallied Sci. 2017;9(4): 251-258.
26. Gazzaz ZJ, Baig M, Alalhedi BSM, Al-Grad MSH, Qurayshah MAA. Perceived stress, reason for and sources of stress among medical students at Rabigh College, king Abdulazzi University Jeddah Saudi Arabia. BMC Med. Educ. 2018;18:29.
    DOI: 10:1186/s12909-018-1133-2
27. Chaudhuri A, Ray M, Hazra SK, Goswami A, Bera S. Correlation of perceived stress with blood group A and O among medical students and its effect on lipid profile in a medical college of Eastern India. Saudi Journal of Sport Medicine. 2016;16(1): 57-61.
28. Garratty G, Glynn SA, McEntire R. Abo and Rh (D) phenotype frequencies of different racial/ethnic groups in the united states. Transfusion. 2004;44(5): 703-704.
29. Musa AU, Ndakotsu MA, Abdul-Aziz IT Kilishi A, Aliyu I. Distribution of ABO and

Rhesus blood group system among blood donors in Sokoto North-Western Nigeria. J. Appl Hematol. 2015;136-8.

30. Medugu JT, Abjah U, Nasir IA, Adegoke S, Asuquo EE. Distribution of ABO RhD blood groups and hemoglobin phenotypes among pregnant women attending a tertiary hospital in Yola, Nigeria. J. Med. Trop. 2016;18:38-42.

31. Hassan A, Babadoko AA, Ahmed AJ, Isa HA, Suleiman AM. The pattern of distribution of ABO blood group in north western Nigeria. Annal of Nigerian Medicine. 2005;1(2):17-18.

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