



## ASSOCIATION OF PERCEIVED STRESS WITH ABO BLOOD GROUP PHENOTYPES AMONG UNDERGRADUATE STUDENTS IN KANO, NIGERIA

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### ABSTRACT

Studies have reported high prevalence of perceived stress among undergraduates but whether it's associated with ABO phenotypes is not clear. The aim of this study was to determine prevalence of perceived stress and its relationship with ABO phenotypes among undergraduate students in Kano, Nigeria. Three hundred and eighty participants were recruited. ABO phenotypes were determined using potent monoclonal antisera while a self-administered perceived stress scale (PSC-30) was used to assess perceived stress. Grade point average (GPA) of previous semester was used as a measure of participant's academic performance. *P* value was taken as  $\leq 0.05$ . Mean (SD) age of the participants was 23.84 (2.21) years (males = 24.04 [2.08], females = 23.40 [2.43];  $P = 0.009$ ). Prevalence of perceived stress was: moderate perceived stress – 51.6%, high perceived stress - 33.2% with males having higher prevalence ( $\chi^2 = 8.87, P = 0.012$ ). ABO phenotypes were significantly associated with perceived stress ( $\chi^2 = 12.50, P = 0.050$ ) with AB and B phenotypes having significantly higher proportion of those with high perceived stress compared to O and A phenotypes. Perceived stress was also significantly associated with level of study of the participants ( $\chi^2 = 14.35, P = 0.026$ ), those in third year of study more affected. However, there was no correlation between perceived stress and academic performance. Prevalence of perceived stress among undergraduates in Kano is high and is associated with ABO phenotypes and level of study. ABO phenotypes should be considered in risk stratification for perceived stress among undergraduates.

**Keywords:** ABO phenotypes, Academic performance, Perceived stress, Undergraduates

### INTRODUCTION

Humans are exposed to various challenges daily that may put them in a state of mental difficulty or worry. In addition to this daily exposure to stressful situations, university students are exposed to stress related to their training. Various studies have reported increased level of perceived stress among different categories of university students (Alsalem *et al.*, 2021; Asani *et al.*, 2016; Fasoro *et al.*, 2019; Malik and Javed, 2021; Worku *et al.*, 2020). Some among first year medical students (Fasoro *et al.*, 2019), some among medical students in their clinical years (Asani *et al.*, 2016), while others in the context of additional burden occasioned by covid-19 pandemic (Barbayannis *et al.*, 2022; Malik and Javed, 2021). The way they perceive this additional stress may differ between them due to differences in personality traits, environment, family background, and other genetic or biological markers. One such biological or genetic factor that could influence how undergraduate students perceive stress is the ABO blood group phenotypes. ABO phenotypes have been linked to various diseases, including psychological and psychiatric diseases. Indeed, a previous study has reported ABO phenotypes to be associated with perceived stress among a group of medical students (Chaudhuri *et al.*, 2016). However, there are very few studies that assessed possible association between ABO phenotypes and perceived stress among undergraduate students in northern Nigeria despite the reported racial, ethnic, and geographical variation in frequency and distribution of ABO phenotypes. The aim of this study was to assess the prevalence of perceived stress and its association with ABO phenotypes and other academic-related factors among undergraduate students in Kano, Nigeria.

### MATERIALS AND METHODS

#### Participants and study design

This was a cross-sectional descriptive study that was carried out between January – February, 2023. The participants were undergraduate students of Faculty of Basic Medical Sciences, Bayero University, Kano, Nigeria at various stages of their training. Each participant must have spent at least a semester in the university, has no recent history of mental illness, and must know his grade point average (GPA) of the previous semester. All the participants gave written individual informed consent before commencement of the study.

#### Sample size determination and sampling technique

Systematic random sampling technique was used to recruit participants into the study. Series of announcements calling for volunteers were made at strategic locations within the premises of the Faculty. About 500 potential participants turned up out of which 380 satisfied the inclusion criteria.

Minimum sample size was calculated using the formula:

$$n = Z^2pq/d^2, \text{ where}$$

*n* = minimum sample size

*Z* = standard normal deviate corresponding to 0.05  $\alpha$  level of significance = 1.96

*p* = proportion of perceived stress from a previous study, we 50% since the true proportion is not known

*q* = complementary probability = (1-*p*) = (1-0.5) = 0.5.

*d* = degree of precision = 0.05

$$n = (1.96)^2(0.5 \times 0.5)/(0.05)^2 = (3.84)(0.25)/0.0025 = 380.$$

### Ethical approval

Ethical approval was obtained from the Health Research Ethics Committee (NHREC/17/03/2018) of Kano state ministry of health via a letter: SHREC/2022/3804. All the participants gave written individual informed consent.

### Determination of ABO blood group

ABO blood group phenotypes were determined using monoclonal anti-A, anti-B, and anti-D reagents (Plamatec Lab. Ltd., Bridport, UK). The method is based on agglutination reaction produced when blood sample is added to the antisera as previously described (Bhatnagar, 2017).

### Assessment of perceived stress

Perceived stress was assessed using Perceived Stress Scale (Levenstein *et al.*, 1993). It is a self-administered questionnaire that has been widely used to assess perceived stress among variety of populations with different clinical conditions. Each participant was instructed to circle the appropriate number according to how he/she feels during the previous semester related to each of the question on the questionnaire. Participants were scored according to the guidelines of the original authors. The final scores were categorized into four quartiles denoting no stress, mild stress, moderate stress, and high stress, respectively. Perceived stress index was also determined by using the formula: raw score – 30/100.

### Statistical analysis

Data were analyzed on Statistical Package for Social Sciences (IBM SPSS) version 23.0. Results were summarized by frequencies, proportions, and mean and SD. Independent t test was used to determine mean difference in quantitative variables between male and female participants, Chi – square test of association was used to determine association between categorical variables. Pearson's correlation was used to determine possible linear relationship between quantitative variables. *P* value is taken as  $\leq 0.05$ .

## RESULTS AND DISCUSSION

A total 380 undergraduate students (males = 264, females = 116) were recruited for this study. The mean (SD) age of the participants is 23.84 (2.21) years with the male participants being older (males = 24.04 [2.08], females = 23.40 [2.43];  $t = 2.65$ ;  $P = 0.009$ ). Mean (SD) cumulative grade point average,

perceived stress score and perceived stress index of the participants are 3.14 (0.77), 60.88 (5.02), and 0.48 (0.07), respectively. Majority of the participants were in their 4<sup>th</sup> (46.8%) and 2<sup>nd</sup> (42.6%) years of study while a few (1.6%) were in their first year. Majority of the participants (51.6%) had moderate perceived stress while about 33.2% had high perceived stress; there was sex variation in prevalence of perceived stress ( $\chi^2 = 8.87$ ,  $P = 0.012$ ) with male participants having higher proportion of those with moderate (52.65% vs 49.14%) and high perceived stress (35.61% vs 27.59%). Frequency and distribution of ABO phenotypes among the participants were: O = 47.1%, A = 20.8%, B = 20.3%, and AB = 11.8%. There was slight sex variation in the distribution of ABO phenotypes ( $\chi^2 = 9.84$ ,  $P = 0.020$ ) with female participants having higher proportion of B phenotypes and the male participants having higher proportion of A phenotypes. Characteristics of the participants as summarized here are presented in tables 1 and 2.

ABO phenotypes were significantly associated with perceived stress ( $\chi^2 = 12.50$ ,  $P = 0.050$ ) with 48.89% of AB and 38.96% of B phenotypes having high perceived stress compared to 26.26% and 34.18% of O and A phenotypes, respectively. This implies that AB and B phenotypes, compared to O and A phenotypes, are associated with higher perceived stress. When the ABO phenotypes were converted into dichotomous categories consisting of O and non-O phenotypes, the non-O phenotypes had significantly higher proportion of those with high perceived stress (39.30 vs 26.26,  $\chi^2 = 8.81$ ,  $P = 0.012$ ). Indeed, AB phenotypes, compared to O phenotypes, were found to be more likely to have moderate or high perceived stress ( $P = 0.002$ ). Perceived stress was also significantly associated with level of study of the participants ( $\chi^2 = 14.35$ ,  $P = 0.026$ ) with about 47% of those who are in their third year of study having high perceived stress compared to other levels. Results of association between perceived stress and ABO phenotypes are presented in table 3.

Perceived stress score did not correlate with age of participants ( $r = -0.083$ ,  $P = 0.106$ ) and their academic performance in the semester preceding the study (GPA) ( $r = 0.040$ ,  $P = 0.439$ ) when the participants were considered as a whole, however, perceived stress score was positively correlated with GPA among males ( $r = 0.202$ ,  $P = 0.001$ ) and negatively so among females ( $r = -0.302$ ,  $P = 0.001$ ) (table 4).

**Table 1: Mean and frequencies of some characteristics of the participants**

Variable	Variable	Mean/N n = 380	SD/% n = 380
Age (years)		23.84	2.21
GPA		3.14	0.77
Perceived stress score		60.88	5.02
Perceived stress index		0.48	0.07
Sex			
	Males	264	69.5
	Females	116	30.5
ABO phenotypes			
	O	179	47.1
	A	79	20.8
	B	77	20.3
	AB	45	11.8
Perceived stress categories			
	Mild stress	58	15.3
	Moderate stress	196	51.6
	High stress	126	33.2

Level of study	Level 1	6	1.6
	Level 2	162	42.6
	Level 3	34	8.90
	Level 4	178	46.8

GPA = Grade point average.

**Table 2: Sex related differences in some characteristics of the participants**

Variable	Variable	Males (n=264)		Females(n=116)		$\chi^2/t$	P
		Mean/N	SD/%	Mean/N	SD/%		
Age		24.04	2.08	23.40	2.43	2.65	0.009
GPA		3.12	0.79	3.04	0.71	1.74	0.083
Perceived stress score		61.07	4.63	60.44	5.81	1.13	0.259
Perceived stress index		0.48	0.06	0.47	0.08	1.11	0.266
ABO phenotypes						9.84	0.020
	O	123	46.59	56	48.28		
	A	56	21.21	23	19.83		
	B	46	17.42	31	26.72		
	AB	39	14.77	6	5.17		
Perceived stress categories						8.78	0.012
	Mild	31	11.74	27	23.28		
	Moderate	139	52.65	57	49.14		
	High	94	35.61	32	27.59		
Level of study					17.10	0.001	
	Level 1	6	2.27	0	0.00		
	Level 2	98	37.12	64	55.17		
	Level 3	31	11.74	3	2.59		
	Level 4	129	48.86	49	42.24		

GPA = Grade point average.

**Table 3: Association between perceived stress and ABO phenotypes among the participants**

Variables	Variables	Mild stress (N)	%	Moderate stress (N)	%	High stress (N)	$\chi^2$	P
ABO phenotypes							12.50	0.050*
	O	26	14.53	106	59.22	47	26.26	
	A	12	15.19	40	50.63	27	34.18	
	B	12	15.58	35	45.45	30	38.96	
	AB	8	17.78	15	33.33	22	48.89	
O and non-O phenotypes							8.81	0.012*
	O	26	14.53	106	59.22	47	26.26	
	Non-O	32	15.92	90	44.78	79	39.30	
Level of study							14.35	0.026*
	Level 1	3	50.00	3	50.00	0	00.00	
	Level 2	25	15.43	85	52.47	52	32.10	
	Level 3	0	00.00	18	52.94	16	47.06	
	Level 4	30	16.85	90	50.56	58	32.58	

**Table 4: Correlation of perceived stress score with age and grade point average**

Variable	All		Males		Females	
	r	P	r	P	r	P
Age	-0.083	0.106	-0.043	0.488	-0.077	0.410
GPA	0.040	0.439	0.202	0.001*	-0.302	0.001*

\*Statistically significant correlation, PSQscore = perceived stress questionnaire score.

## Discussion

This study evaluated the prevalence of perceived stress and its possible association with ABO blood group phenotypes and academic-related factors among a cohort of undergraduate students. Prevalence of perceived stress among the participants is high, 51.6% had moderate while 33.2% had

high perceived stress. Collectively, more than 80% of the participants had either moderate or high perceived stress. A number of studies have reported a similarly high prevalence of perceived stress among different categories of undergraduate students. (Asani *et al.*, 2016; Ekpenyong and Inamete, 2019; Fasoro *et al.*, 2019; Malik and Javed, 2021;

Worku *et al.*, 2020) However, one study reported a relatively low prevalence of 12%. (Alsalem *et al.*, 2021) Three out of the studies cited above were conducted among African students studying in African countries just like the participants of our study while the study that reported lower prevalence was conducted among students from Saudi Arabian. It seems that students from sub-Saharan Africa reports higher prevalence of perceived stress compared to their counterparts in other parts of the world. Sub-Sahara Africa is indeed facing challenges of worsening economic indices, social issues, and in some cases political instability. These and other challenges peculiar to the region could have accounted for the higher prevalence of perceived stress among undergraduate students in the region. This finding, though preliminary, call for relevant authorities to take measures that can alleviate this high level of perceived stress among students. We found male participants to have higher prevalence of perceived stress among our participants. This contradicts other studies that reported females as having higher prevalence of perceived stress compared to males. (Alsalem *et al.*, 2021; Barbayannis *et al.*, 2022) However, a study that looked at prevalence of perceived stress among medical students in their clinical years did not find sex difference. (Asani *et al.*, 2016) Female students in this environment are likely to be sponsored by their parents or family members compared to their male counterparts that may be sponsoring themselves and thus adding to the academic stress they are exposed to. This probably explain why male participants in our study reported higher prevalence of perceived stress. Indeed, majority of the study population used by Asani *et al.* (Asani *et al.*, 2016), who are from same university and environment with the participants of our study, are placed on monthly stipend by their state governments and had no sex difference in reported prevalence of perceived stress. This implies that the higher prevalence among male participants in our study is likely due to added financial constraint to which the male students are exposed to. Similarly, we found students who are in third year of their study to have higher prevalence of perceived stress. This could be a random finding; it however requires further exploration so that solutions could be offered.

Frequency and distribution of ABO phenotypes in our study is similar to what has been reported for Nigerian population:  $O > A > B > AB$ . A similar pattern has indeed been reported among undergraduate students in the same university in another study. (Gwarzo, Isyaku Mukhtar; Rahamat Salisu; Salisu, 2020) There was however a slight sex difference in the distribution of the phenotypes with female participants having higher proportion of B phenotypes while males having higher proportion of A. Despite the slight sex difference, the pattern is still that of Nigeria and northwest Nigeria. (Anifowoshe *et al.*, 2017; Mukhtar and Abdulkadir, 2019)

We found ABO phenotypes to be significantly associated with perceived stress among the participants of this study in both sexes. Specifically, non-O phenotypes were associated with higher prevalence of perceived stress compared to O phenotypes. Among the non-O phenotypes, AB had the highest prevalence of perceived stress followed by B phenotypes. This implies that AB and B phenotypes are significantly associated with higher prevalence of perceived stress among our participants. There are not many studies that looked at association between ABO phenotypes and perceived stress among undergraduate students. In fact, this study is the first, to our knowledge, to do so in northern Nigeria. Our finding on association between ABO phenotypes and perceived stress contradict what has been reported by two previous studies. (Chaudhuri *et al.*, 2016; Ekpenyong and

Inamete, 2019) They found O phenotypes to be associated with higher prevalence of perceived stress among undergraduate students in Nigeria and Saudi Arabia. However, another study reported no association between ABO phenotypes and perceived stress in Indian student population. (Yogeeswaran *et al.*, 2018) There seems to therefore be an association between ABO phenotypes and perceived stress but the pattern, from available literature, is yet to be fully understood.

Perceived stress score did not correlate with academic performance of the students in our study. However, perceived stress score was positively and negatively correlated with academic performance among male and female participants respectively. A number of studies have reported negative correlation between perceived stress score and academic performance. (Barbayannis *et al.*, 2022; Malik and Javed, 2021) Better coping strategies and adaptation could possibly explain why there was no correlation between perceived stress and academic performance in our study. Indeed, none of the Nigerian studies we cited reported significant correlation between perceived stress and academic performance. Our finding of no correlation between perceived stress and academic performance is a welcome development given the high prevalence of perceived stress among the participants. However, the positive correlation between perceived stress and academic performance among male participants as against the negative correlation among female participants could imply better stress coping strategy among the male participants.

## CONCLUSION

Prevalence of perceived stress among undergraduate students in Kano, Nigeria, is high and affects more males than females. Non-O phenotypes, especially AB and B phenotypes, are significantly associated with perceived stress. Perceived stress and perceived stress index are not correlated with academic performance.

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