

Sex and Age-related Occurrences of Hypotension and Pre-diabetes

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Abstract

Objective: This study was aimed at assessing the occurrence of hypotension and pre-diabetes among various sex and age range of individuals.

Method: Blood pressure (mmHg) and blood glucose (mg/dl) were determined; Data of subjects classified as hypotension (BP < 90/60 mmHg) and/or pre-diabetes (FBS; 100 – 125 mg/dl, RBS; 140-200mg/dl) were used for the study. SPSS (v25) was used for data analysis and the occurrence of hypotension and/or pre-diabetes among various sexes (male, female) and age intervals (15>25 years, 25>35 years, 35>45 years, 45>55years) of individuals was ascertained.

Results: Data of sixty-two (62) subjects was purposively selected for the study; 61.3% were females while 38.7% were males. Greater proportion (72.6%) had age 15>25, 17.7% had age 25>35, 3.2% had age 35>45 and 6.5% had age 45>55. About 28 (45.2%) had hypotension only, 27 (43.5%) had pre-diabetes only; while 7 (11.3%) had coexistence of hypotension and pre-diabetes. There was equivalent prevalence of hypotension among the females and males; females had higher (66.7%) occurrence of pre-diabetes than males (33.3%). There was also higher prevalence of coexistence of hypotension and pre-diabetes in females (85.7%) than males (14.3%) at $P=0.17$, $X^2=3.59$. Individuals with age 15>25 had higher prevalence of hypotension (82.1%), pre-diabetes (63.0%) as well as coexistence of hypotension and pre-diabetes (71.4%) when compared to age 25>35, 35>45 and 45>55 years at $P=0.46$, $X^2=5.67$.

Conclusion: despite the differences in occurrence of hypotension and pre-diabetes among various sexes and age range, there was no statistically significant association between the studied pathophysiological conditions and sex or age at $P<0.05$; which has demonstrated that hypotension and pre-diabetes can occur to any sex at any age.

Keywords: Blood pressure, Blood sugar, Hypotension Pre-diabetes

Introduction

Blood pressure (BP) refers to the force exerted by circulating blood against the walls of the arteries. It is measured using a sphygmomanometer and expressed as systolic/diastolic values in mmHg. Hypotension occurs when blood pressure falls to a level where systolic BP is less than 90 mmHg, and diastolic BP is less than 60 mmHg^{1,2}. This condition can lead to a reduction in blood supply to the brain, heart, and other organs, resulting in decreased nutrient delivery and potential organ damage. Severe hypotension may even lead to coma; reports indicate that significant intracranial hypotension and brain damage from inadequate nutrient supply can cause orthostatic coma^{3,4}.

Blood glucose, or blood sugar, refers to the concentration of sugar in the blood; it is measured using a glucometer and expressed in mg/dl. An elevated glucose level above the normal range is referred to as hyperglycemia, which can increase the risk of developing diabetes mellitus^{5,6}. Various pathophysiological conditions, including type 2 diabetes, have been linked to differences in sex and age^{7,8}, highlighting the potential influence of these factors on disease susceptibility. In this study, the occurrence of hypotension and pre-diabetes in relation to sex and age will be evaluated to determine whether these conditions may be associated with specific age groups or sex.

Materials and Methods

This study was conducted in accordance with fundamental ethical principles. A total of 62 male and female subjects were purposively selected during a community service program conducted by 300-level medical students at Gregory University, Uturu. Consent was obtained from participants, and confidentiality was strictly maintained. Blood pressure and blood glucose levels were measured, and only participants classified as having hypotension or pre-diabetes, as defined by⁶, were included in the study. Demographic data, such as age and sex, were collected as described in previous studies^{9,10}. Statistical analysis was performed using SPSS (v25), with comparisons between age, sex, and the incidence of hypotension and pre-diabetes assessed via Chi-square (X^2) tests. Statistical significance was considered at $P < 0.05$.

Results

Profile of subjects

Total of sixty-two (62) subjects was purposively selected for the study; 61.3% were females while 38.7% were males. Greater proportion (72.6%) had age 15>25, 17.7% had age 25>35, 3.2% had age

35>45 and 6.5% had age 45>55. 28 (45.2%) had hypotension only, 27 (43.5%) had pre-diabetes only; while 7 (11.3%) had coexistence of hypotension and pre-diabetes (Table 1).

Table 1: Profile of subjects

Variables	Frequency (n)	Percentage (%)	Total n (%)
Sex			
Female	38	61.3	62(100)
Male	24	38.7	
Age			
15-25	45	72.6	62 (100)
26-35	11	17.7	
36-45	2	3.2	
45-55	4	6.5	
Hypotension and pre-diabetes occurrence			
Hypotension	28	45.2	62 (100)
pre-diabetes	27	43.5	
Co-existing	7	11.3	

Sex-related occurrence of hypotension and pre-diabetes

There was equivalent prevalence of hypotension among the females and males; females had higher (66.7%) occurrence of pre-diabetes than males (33.3%). There was also higher prevalence of coexistence of hypotension and pre-diabetes in females (85.7%) than males (14.3%) at P=0.17, X²=3.59 (Table 2).

Table 2: Occurrence of hypotension and pre-diabetes among Sex

Variables		Hypotension	Co-existing	Pre-diabetes	Total
Female	Frequency (n)	14	6	18	38
	% within Sex	36.8%	15.8%	47.4%	100.0%
	% between Sex	50.0%	85.7%	66.7%	61.3%
	% of Total	22.6%	9.7%	29.0%	61.3%
Sex Male	Frequency (n)	14	1	9	24
	% within Sex	58.3%	4.2%	37.5%	100.0%
	% between Sex	50.0%	14.3%	33.3%	38.7%
	% of Total	22.6%	1.6%	14.5%	38.7%
Total	Frequency (n)	28	7	27	62
	% within Sex	45.2%	11.3%	43.5%	100.0%
	% between Sex	100.0%	100.0%	100.0%	100.0%
	% of Total	45.2%	11.3%	43.5%	100.0%
Chi-Square Tests		Value	df	Asymptotic Significance (2-sided)	
Pearson Chi-Square		3.593 ^a	2	0.166	
Likelihood Ratio		3.832	2	0.147	
N of Valid Cases		62			

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.71.

Age-related occurrence of hypotension and pre-diabetes

Individuals with age 15>25 had higher prevalence of hypotension (82.1%), pre-diabetes (63.0%) as well as coexistence of hypotension and pre-diabetes (71.4%) when compared to age 25>35, 35>45 and 45>55 years at P=0.46, X²=5.67 (Table 3).

Table 3: Occurrence of hypotension and pre-diabetes among Age

Variables		Hypotension	Co-existing	Pre-diabetes	Total	
Age	15-25	Count	23	5	17	45
		% within age	51.1%	11.1%	37.8%	100.0%
		% between age	82.1%	71.4%	63.0%	72.6%
		% of Total	37.1%	8.1%	27.4%	72.6%
	26-35	Count	4	2	5	11
		% within age	36.4%	18.2%	45.5%	100.0%
		% between age	14.3%	28.6%	18.5%	17.7%
		% of Total	6.5%	3.2%	8.1%	17.7%
	36-45	Count	0	0	2	2
		% within age	0.0%	0.0%	100.0%	100.0%
		% between age	0.0%	0.0%	7.4%	3.2%
		% of Total	0.0%	0.0%	3.2%	3.2%
	45-55	Count	1	0	3	4
		% within age	25.0%	0.0%	75.0%	100.0%
		% between age	3.6%	0.0%	11.1%	6.5%
		% of Total	1.6%	0.0%	4.8%	6.5%
	Total	Count	28	7	27	62
		% within age	45.2%	11.3%	43.5%	100.0%
		% between age	100.0%	100.0%	100.0%	100.0%
		% of Total	45.2%	11.3%	43.5%	100.0%
Chi-Square Tests		Value	df	Asymptotic Significance (2-sided)		
Pearson Chi-Square		5.671 ^a	6	0.461		
Likelihood Ratio		6.705	6	0.349		
N of Valid Cases		62				
a. 9 cells (75.0%) have expected count less than 5. The minimum expected count is 0.23.						

Discussion:

Hypothesis was given that the sex of an individual could be an influencing factor to the proneness of an individual to hypotension and pre-diabetes; considering reports that among other factors like lifestyle & medical conditions, hormonal changes which are factor associated with various sexes could play a role in hypotension as hormonal fluctuations related to pregnancy, menstrual cycle or other disorders could influence blood pressure regulation ^{11,12}. Although, this study reported equivalent prevalence of hypotension among the females and males, there was higher prevalence of

coexistence of hypotension and pre-diabetes in females (85.7%) than males (14.3%) which may be ascribed to suggested proneness of females to orthostatic hypotension due to differences in blood vessel elasticity and hormone fluctuations^{13,14}. Females also had higher (66.7%) occurrence of pre-diabetes than males (33.3%) which may be as a result sex-related factors such as Polycystic Ovary Syndrome which is associated with insulin resistance and poses higher risk of developing pre-diabetes and type-2 diabetes in women. Gestational Diabetes developed during pregnancy increases the risk of type 2 diabetes later in life^{15,16}. Despite these factors this study reported statistically non-significant variations at $P < 0.05$ which suggests no direct sex-related links between hypotension and pre-diabetes, certain conditions that predominantly affect one sex can indirectly influence the risk of both. Hence, maintaining a healthy lifestyle, including a balanced diet, regular exercise, and managing stress, is essential for reducing the risk of both hypotension and pre-diabetes.

This study reported statistically non-significant occurrence of hypotension and pre-diabetes among 15>25, 25>35, 35>45 and 45>55 years at $P < 0.05$ which is in line with reports that these pathophysiological conditions can occur at any age; although, certain age-related factors can influence its prevalence as age-related changes such as blood vessel elasticity, reduced sensitivity of baroreceptors and alterations in the body's cardiovascular response can lead to a higher likelihood of hypotension in elderly individuals¹⁷⁻¹⁹. Also, pre-diabetes and its progression to type-2 diabetes are influenced by age-related changes in metabolism, insulin sensitivity, and body composition^{20,21}.

Study Limitation

Sample Size: The study's sample size of 62 participants is relatively small due to the studied population and the purposive sampling approach which included only individuals with hypotension and pre-diabetes, which could impact the statistical power and robustness of our findings. Also, dividing the sample into age groups further reduces the size within each category, potentially limiting the generalizability of the results. Future research with a larger population and sample size is recommended to strengthen the reliability and applicability of these findings to a broader population.

Sampling Method: We employed a purposive sampling approach, which limited the representativeness of the sample. This non-random sampling strategy was chosen to meet specific study objectives but may restrict the generalizability of the findings to the general population. Future studies should consider random sampling techniques to enhance representativeness.

Statistical Analysis: Although the Chi-square test was used appropriately to assess associations, alternative statistical tests might yield more accurate results depending on the data distribution. Future studies should consider additional or alternative analyses, such as ANOVA or non-parametric tests, to ensure the robustness of the findings based on data characteristics.

Conclusion

Although, both hypotension and pre-diabetes can be influenced by age-related changes in the body's physiology, this study demonstrated there was no direct age and sex-related links between incidence of hypotension and pre-diabetes suggesting it may occur to a sex and at any age, whereas certain conditions that predominantly affect one sex and/or result from aging can indirectly influence the risk of both.

Conflict of interest: None

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