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Association between prehypertension and psychological distress among adults in Saudi Arabia: A population-based survey

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ABSTRACT

Background: Prehypertension is a precursor to hypertension status. Psychological distress has been identified earlier among hypertensives; however, there is little evidence for the presumptive relationship between prehypertension and psychological distress.

Objective: The study aimed to assess the psychological wellbeing of the Al-Kharj, Saudi Arabia population, using the General Health Questionnaire (GHQ-12) and correlating it with prehypertensive patients in the same population.

Methods: A cross-sectional analysis of the population of Al-Kharj, Saudi Arabia, was carried out between January and June of 2016. With an 85 percent response rate, a total of 1016 participants participated in the study. A multiple linear regression analysis was performed to assess the relationship between prehypertension and psychological distress.

Results: The findings of the adjusted analysis demonstrated that, on average prehypertensive patients were more distressed psychologically than non-hypertensive patients (unstandardized Beta regression coefficient = 3.600; P-value 0.025). Similarly, on average women were found to be more psychologically distressed than men (unstandardized Beta = 1.511, P-value 0.002). Civil workers and unemployed individuals were more psychologically distressed than employed individuals (unstandardized Beta = 1.326, P-value 0.041) while adjusting for the sociodemographic and other variables such as BMI, diabetes status, cholesterol, and smoking status.

Conclusion: The current study shows that as compared to normotensive patients, self-rated mental wellbeing and psychological wellbeing are all considerably poorer among prehypertensive patients. To prevent individuals from having negative psychological outcomes and their long-term complications, the Government of Saudi Arabia needs to concentrate on prehypertensive, female, and unemployed individuals. Well-designed longitudinal studies, primarily in Saudi Arabia, are needed in the future to research the cause and impact of poor mental health and prehypertension.

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1. Introduction

Globally the burden of hypertension has increased in recent years. China has reported an increase from 20% to 31.2% among men in a span of less than a decade (2002–2009). (Chen et al., 2017; Wang et al., 2014; Wu et al., 2008) Saudi Arabia has reported a prevalence of 25.5% amongst a population ranging in age between 15 and 64 years. (Al-Hamdan et al., 2011) The prevalence of prehypertension in a cross-sectional survey of 15,296 Chinese was 29%. (Hu et al., 2017) In the same study, it was also seen that

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prehypertension prevalence decreased with age, and that of hypertension (HTN) increased (Hu et al., 2017). The prevalence of prehypertension in the Bangladeshi population was 44.5% among urban and 41.5% among rural people. (El-Metwally et al., 2018). Prehypertension is a precursor to hypertension. According to Chobanian et al. (2003a); Aldiab et al. (2018), the term “prehypertension” first emerged in the seventh edition of the Joint national committee on prevention, detection, evaluation, and treatment of hypertension (JNC-VII). It was believed that control of this at-risk cohort could potentially reduce the overall incidence of cardiovascular diseases (Chobanian et al., 2003b). Currently, the treatment of choice for management of prehypertension is non-pharmacological therapy, which includes lifestyle modification. These include control of obesity and healthy diet. (Svetkey, 2005) Two recent trials have suggested a possible role of drugs to control the incidence of hypertension. (Julius et al., 2006; Lüders et al., 2008).

Psychological health is a significant component of the overall health of an individual (El-Metwally et al., 2018) and defined as a state of complete social, physical, and mental wellbeing. (Organization, 2001b). The World Health Organization (WHO) defines it as “a state of mental wellbeing in which every person realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to her or his community” (Organization, 2001a). Several scales have been used to assess an individual’s health; among them, the General health questionnaire (GHQ) is the most commonly used in research studies. (El-Metwally et al., 2018). The GHQ is a reliable tool to evaluate the psychological wellbeing of an individual (Jackson, 2007). It was initially formulated by Goldberg in the 1970s and has since been popularized (Goldberg, 1972). This tool has been utilized in both outpatients as well as inpatient settings (Jackson, 2007). More so, it has been used in population health assessment surveys (Goldberg et al., 1997). The GHQ has many versions, owing to the ease of use; GHQ-12 is most commonly administered (Romppel et al., 2013; Abubakar and Fischer, 2012). Initially, it was formulated as a unidimensional scale, but studies have shown that multidimensional models were more suitable (Winefield et al., 1989) An Iranian study, working on two-factor structures has demonstrated similar results to a survey conducted by WHO mental wellbeing of the general population (Montazeri et al., 2003). Similarly, a study coming out of New Zealand (Kalliath et al., 2004) suggested the use of the two-factor structure of GHQ-12, whereas, a Spanish study supported the use of the three-factor structure of GHQ-12 (del Pilar Sánchez-López and Dresch, 2008). Therefore, this suggests that the data fits better in the two and three-factor models than a unidimensional model. It has also been shown to have high sensitivity and specificity (Endsley et al., 2017; Daradkeh et al., 2001). To add to its testament, GHQ-12 has been translated into 38 different languages (Baksheev et al., 2011; Jacob et al., 1997; Park et al., 2012; Hu et al., 2007)

Psychological distress amongst hypertensives has previously been reported; however, evidence amongst prehypertensives is scarce to missing. To the best of our knowledge, psychological distress among prehypertensives has not been assessed using GHQ-12. The purpose of the present study is to evaluate the psychological wellbeing amongst the participants of Al-Kharj, Saudi Arabia, using GHQ-12 and correlating it with patients with prehypertension within the same population.

2. Material and methods

2.1. Study design

A cross-sectional analysis was carried out in the population of Al-Kharj, Saudi Arabia. A multi-stage cluster sampling was utilized

to collect data from January–June 2016. With an 85% response rate, we had complete data collected on 1016 participants.

2.2. Inclusion criteria

Eligibility criteria included all adult Saudi residents (18 years of age and older) who were willing to participate in the study.

2.3. Instruments

A self-administered 12-item questionnaire (GHQ-12) was provided to the participants. The questionnaire contained six positive items and six negative items, evaluating the overall mental wellbeing of the participant (El-Metwally et al., 2018). Demographic information was also obtained from each participant. The blood pressure (BP) was assessed by a trained staff from the participants’ right arm after they took five-minute rest, using a sphygmomanometers (mercury) and a stethoscope. The mean value of three BP readings taken at different times were obtained and was included in the study. The prehypertension include blood pressure ranges: for systolic blood pressure: 120–139 mm Hg, and for diastolic blood pressure : 80–89 mm Hg (Almustafa, 2018).

Ethical approval

Ethical approval was taken before the beginning of the study from the Institutional Review Board (IRB) of the College of Medicine, Prince Sattam Bin Abdulaziz University. Written and verbal consent was taken from the participants after explaining the survey. Anonymity of the study participants was kept confidential at all times.

2.4. Statistical analysis

Data were analyzed using SPSS version 26.0 on windows. An unpaired independent-samples *t*-test was used to assess the difference between prehypertensive and hypertensive individuals on GHQ score. Further, a multiple linear regression was conducted to examine the association between prehypertension (independent variable with two categories: prehypertensive versus normotensive) and the total GHQ score (outcome variable).

3. Results

3.1. Findings of univariate analysis

We derived a total GHQ score (Mean = 12; SD = 5.23), as reported previously (El-Metwally et al., 2018), to compare between prehypertensive individuals and normotensive (i.e., with normal blood pressure) individuals. An unpaired independent-samples *t*-test was conducted. The results showed a *t*-test statistic of 1.403 (degrees of freedom/DF = 1001) and a two-tailed significance *p*-value of 0.161. This *t*-test result indicates that the mean difference in total GHQ score between the two groups (prehypertensive versus normotensive) individuals was not statistically different – yet it has important implications for public health prevention and management of prehypertension as a chronic health condition.

3.2. Findings of multiple linear regression analysis

A multiple linear regression model was utilized to analyze the relationship between prehypertension status (binary independent variable with two categories: no prehypertension/yes prehypertension) and the total GHQ score as the outcome variable (Table 1). It was found that higher psychological distress, as demonstrated by a higher total GHQ score, was significantly and positively correlated with prehypertension status after adjustment for sociodemo-

graphic and certain lifestyle risk factors variables (weight status/BMI; diabetes status; cholesterol; smoking status) (i.e., in more prehypertensive individuals). The unstandardized Beta regression coefficient = 3.600; $P = 0.025$). Being diagnosed with prehypertension has 3.6 times higher risk of psychological distress. Women were also more likely to have higher psychological distress than men (unstandardized Beta = 1.511, $P = 0.002$). Job status, whether being unemployed or civil worker, was significantly associated with higher psychological distress (unstandardized Beta = 1.326, $P = 0.041$), as illustrated in Table 1 below.

4. Discussion

We aimed to conduct a population-based survey to assess the relationship between prehypertension and psychological distress in the Saudi population. The findings of the adjusted analysis demonstrated that on average prehypertensive patients were more distressed psychologically than non-hypertensive patients. Similarly, the findings revealed that, on average women were found to be more psychologically distressed than males. Civil workers and unemployed individuals were found to be more psychologically distressed than employed individuals while adjusting for the sociodemographic and other variables such as BMI, diabetes status, cholesterol, and smoking status.

Our findings regarding the association between prehypertension and psychological distress are consistent with other studies conducted across the world. For example, the findings of the systematic review and meta-analysis revealed that hypertensive patients are 2.69 times likely to be depressed and have a higher incidence of psychosocial stress as opposed to non-hypertensive patients (Liu et al., 2017). However, there is mixed evidence regarding the relationship between hypertension and psychological distress because some of the cohort studies have reported null findings regarding the relationship between hypertension and psychological distress (Agyei et al., 2014; Shinn et al., 2001). However, these cohort studies are affected by selection bias and reported to have a small number of patients; therefore, their findings need to be interpreted with caution (Agyei et al., 2014; Shinn et al., 2001). In contrast, a cross-sectional study affirmed our study findings by reporting a positive relationship between prehypertension and psychological distress (Peltzer et al., 2017). These findings can collectively be explained by numerous underlying mechanisms, such as behavioural and pathological responses (Saavedra et al., 2011). For instance, animal and human studies have revealed that inflammatory markers such as angiotensin II, corticotrophin-releasing hormone, and levels of interleukin-6 could explain the relationship between prehypertension and psychological stress (Saavedra et al., 2011; Brydon et al., 2004; Lee et al., 2004).

Similarly, our results based on the GHQ score on the relationship between female and negative psychological outcomes are

analogous to current evidence. Numerous articles have shown that women are more depressed than men (Cyranowski et al., 2000). These findings of women who are more influenced by negative psychological effects are rooted in variations in biological sex rather than in external factors such as culture, eating patterns, level of education, and many other social and economic causes that are potentially confusing. However, it was also found that this skewed ratio of negative psychiatric conditions prevails, especially at a young age, and becomes blurred in the older age (Patten et al., 2006). The theoretical explanation for this result may be due to women's exposure to multiple reproductive stages of life (Albert and Newhouse, 2019). Correlated with hormonal changes, this in fact indicates that women have been shown to be more influenced by negative psychological effects since being pregnant and around menopause due to hormonal changes during puberty. This may mean that hormonal shifts could explain the negative psychological results among women (Albert, 2015). In our research, however, we did not rule out this, but the current evidence is adequate to justify such results. Regardless of the underlying factors or causes of adverse outcomes, women who are vulnerable are at greater risk of adverse outcomes and more effort should be paid to avoid worsening their quality of life.

Finally, we found that unemployed people were at a higher risk than working individuals of developing negative psychological effects. These results are comparable to other researches across the globe. For instance, results from a meta-analysis found that unemployed people had lower levels of psychological and physical wellbeing than working people (McKee-Ryan et al., 2005). The fact that unemployed people can be stigmatized in society, which affects their mental health and is expressed in the negative psychological results, may explain these findings (O'Donnell et al., 2015). This is further validated and endorsed by the conflicting evidence that working individuals are mentally sound because of their happy lives, satisfaction of their needs and respect in society (Kossen and McIlveen, 2018; Blustein, 2013). In addition, unemployment is often connected to the idea of marginalization in which unemployed people in society are overlooked or disregarded and thus not accepted in the mainstream of society, which in turn is expressed in the negative psychological effects (Blustein, 2013). The government of Saudi Arabia needs to take immediate steps to support unemployed citizens, regardless of the underlying mechanisms for the connection between unemployment and negative psychological outcomes, by increasing their work prospects to protect them from getting negative psychological outcomes.

4.1. Strengths and limitations

To the best of our knowledge, our research is the first to use a validated instrument to investigate the mental wellbeing of prehypertensives in Saudi Arabia (GHQ-12). The strength of our

Table 1
Multiple linear regression model regressing total GHQ score on prehypertension status and other sociodemographic and lifestyle factors (n = 1018).

Variables	Unstandardized Beta (B)	S.E. of B	P-value	Standardized B	95% C.I. for Odds ratio	
					Lower	Upper
Prehypertension status (yes)	3.600	0.337	0.025	2.058	2.760	3.961
Age	0.014	0.027	0.617	0.023	-0.041	0.069
Gender (Female)	1.511	0.495	0.002	1.141	0.540	2.482
Marital status (single/not married)	-0.375	0.454	0.408	-0.035	-1.266	0.515
Education level	-0.197	0.219	0.369	-0.031	-0.627	0.233
Job (not working; or civilian)	1.326	0.421	0.041	1.035	1.153	2.501
Body Mass Index (BMI)	0.014	0.027	0.603	0.018	-0.039	0.067
Diabetes status (diabetic)	-0.650	0.405	0.109	-0.056	-1.446	0.145
Cholesterol level	-0.276	0.203	0.176	-0.045	-0.675	0.123
Smoking status	0.124	0.299	0.680	0.015	-0.463	0.711

research is that in a population-based sample, we used a validated instrument for the evaluation of mental wellbeing. We also enrolled a large cohort of Saudi Arabian adults residing in Al-Kharj region. Our analysis and data can be used as a stepping stone for further research into a wider pre-hypertensive population. It will also be sensitive to the degree of the mental wellbeing of the Saudi population by health care practitioners in Saudi Arabia. Further studies should aim to study the association of genetic factors with psychological distress in hypertensive patients. They may assess their patients in this way and refer them to the valued psychosocial support department. Our research is interesting in that it illustrates a critical and overlooked feature of a pre-hypertensive adult community in Saudi Arabia.

Our study has a few limitations. First, it was a cross-sectional analysis of a subgroup of the Al-Kharj population. It is difficult to infer causation since it does not account for temporality, that is, if hypertension induces psychosocial stress or hypertension is induced by psychological stress. The data is also extracted from the population of Al-Kharj. Retired and unemployed people were not included. The current findings of the study should be viewed with a bit of caution since these findings may not be directly applied to the Saudi Arabian entire population. However, the Al-Kharj region is a mixed urban and rural area. The Al-Kharj population is also comparable to other parts/regions of Saudi Arabia; thus strengthening our study's external validity.

5. Conclusion

The current study shows that as compared to normotensive patients, self-rated mental wellbeing and psychological wellbeing are all considerably poorer among pre-hypertensive patients. Therefore, instead of waiting for a precise issue or decline of psychological status to be detected, there is a need to assess these patients for psychological wellbeing. Furthermore, diagnosis, screening and treatment must regularly be integrated into the daily care of patients. In addition, in view of the current results, it is important to design and incorporate tailored services and strategies to address the mental health needs of pre-hypertensive patients in Saudi Arabia. To prevent them from having negative psychological results and their long-term complications, the government of Saudi Arabia needs to concentrate on pre-hypertensive, female, and unemployed individuals. Well-designed longitudinal studies, primarily in Saudi Arabia, are needed in the future to research the cause and impact of poor mental/psychological health and prehypertension. Further studies are also needed to make causal inferences and to explore the relationship between poor mental health and prehypertension in the Saudi population, as well as important determinants of this relationship.

Contributors

All authors participated equally in the conceptualization and writing of the research article and had access to the data. All authors contributed to the final revisions, and approved the submitted final draft of the manuscript.

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Informed consent

Informed consent was obtained from all individuals recruited in the study

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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