Do People Live at Sea Level and the Dead Sea Level Have Different Patterns of Anti-Hypertensive Drugs

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Abstract

Background: people live at various areas of sea level may have different patterns of anti-hypertensive drugs. Such a relation has never been reported in Jordan.

Study objectives: the current study investigated how the sea level will impact the prevalence of hypertension in these areas, and how will affect the pharmacological properties of such a population.

Methodology: a cross-sectional study design was involved to collect data from study participants. A total of 1000 participants were randomly selected from the two study areas. 500 participants from each. Participants were matched for age and gender. Blood pressure were measured for all participants. Blood samples were withdrawn to investigate the level of angiotensin II. Data was collected through organizing a working excel sheet and was further analyzed through using SPSS version 20. Data was presented as means, standard deviations, frequencies and percentages. The relationships between variables were examined using independent T-test. Significance was measured at an alpha ≤ 0.05.

Study findings: the main findings of the present study were that the mean of SBP is significantly higher in the Dead Sea (122.42±10.53 mmHg) than the Sea level area (118.07±11.64 mmHg), (p=0.001). Another significant variable was MBP which its mean was 91.64 ± 8.90 mmHg in the Dead Sea and 89.84 ± 8.72 mm Hg. The difference in the mean was statistically significant (p=0.001). The level of angiotensin II was 8.84 ± 4.65pg/ml in the Dead Sea area and 11.21± 6.05pg/ml in the area of the Sea level. The difference in the mean of the two study areas was not statistically significant (p>0.05).

Conclusions: although the level of angiotensin II was not significantly varied between the study areas, but its trend was to be higher in the Sea level area. It was surprised to have higher levels of SBP and MBP in the Dead Sea rather than the Seal level area. It can be implied that the therapeutic options of hypertensive drugs follow different patterns independent of angiotensin II pathways.

Keyword: Hypertension, angiotensin II, SBP, MBP, the Dead Sea, the Sea level

Introduction

Hypertension is considered as a main factor associated with morbidity and mortality (Hasan, 2016). Epidemiological studies have indicated that hypertension is responsible for the majority of stroke cases and ischemic heart diseases. It has been estimated that the rate of chronic kidney disease to be approximately 22% among patients with non-diagnosed hypertension and 17% of those who have pre-hypertension in the USA (Alam et al., 2014).

The definition of hypertension includes increased systolic blood pressure (SBP), diastolic blood pressure (DBP) or both (Chobanian et al, 2003).

The treatment of hypertension is the main approach to lower blood pressure (BP) and it has been shown that most of the patients need more than one antihypertensive drug to reach BP goals. The recommended treatments for hypertension include diuretics, calcium, beta-blockers, ACE-inhibitors and angiotensin receptor blockers (ARB) as first line treatment (Black et al., 2001; Cushman et al., 2002; Chobanian et al, 2003; Turnbull, 2003).

Living at altitude areas is expected to lead to hypoxia and is considered as a risk factor for developing hypertension (Wolfel et al., 1985; Brito et al., 2007). According to the study of Luks (2007), no clear mechanisms explaining the increased blood pressure at high altitudes and further, guidelines or patient-centered strategies to control patients with hypertension at high altitudes are not well accepted. In their study, Parati et al (2014) showed that treatment using the angiotensin receptor blocker telmisartan led to a minor decrease in the 24 h ambulatory BP at 3400 m altitude, but had no effect on BP at 5400 m altitude. We think that these findings are important and could have impacts on the choice of antihypertensive treatment during travel to high altitude.

Study objectives: the main objectives of this study were to investigate how the blood pressure is affected by the Sea level and the possible impacts on selection of anti-hypertensive treatments.

Methodology

The methodology section involves the study design which was cross sectional to collect data from study participants within the same frame time. The study was conducted in two areas in Jordan, the Dead sea and the Sea level The study included 1000 participants, 500 from each area. Data was collected through constructing a questionnaire which included the following variables: age, weight, height, BMI, waist circumferences, SBP, DBP, MBP, pulse rate, PCV, and angiotensin II. All the data were entered into SPSS version 20 for statistical analysis. The means and standard deviations were used to present data, the relationships between study variables were examined using independent T test, and significance was considered at alpha level <0.05.

Results:

General characteristics of participants

The data presented in table 1 and figure 1showed a general description of characteristics of participants and statistically compared between the means for each variable according to the study area. There were no statistically significant differences in the mean for the following variables: age, weight, height, BMI, and waist circumferences ($p>0.05$). SBP was significantly higher in the Dead Sea (122.42±10.53 mmHg) than the Sea level (118.07±11.64 mmHg) ($p=0.001$). No significant differences were observed for the mean of DBP between study areas ($p>0.05$). On the other hand, significant difference in the mean for MBP were observed so that the mean in the Dead Sea (91.64 ± 8.90) was higher than that in the Sea level (89.84 ± 8.72) ($p=0.001$). No significant differences were observed for the mean of pulse rate and PCV among study participants.

Table 1: Comparison between the Means and Standard Deviations of Blood Pressure and other Variables in the Dead Sea and Sea Level Areas.

Variables	Dead Sea	Sea level	P value
	Mean ± std	Mean ± std	
Age	17.60 ± 0.51	17.60 ± 0.51	NS
Weight/kg	67.31 ± 10.77	67.69 ± 8.70	NS
Height/cm	169.29 ± 6.52	170.50± 5.85	NS
BMI	23.45 ± 3.27	23.26 ± 2.57	NS
Waist cir./c	76.37 ± 10.26	76.38 ± 6.00	NS
SBP/mmHg	122.42±10.53	118.07±11.64	0.001
DBP/mmHg	76.31 ± 9.14	75.74 ± 8.48	NS
MBP/mmHg	91.64 ± 8.90	89.84 ± 8.72	0.001
Pulse/minute	79.74 ± 6.17	79.07 ± 6.46	NS
PCV	42.17 ± 3.18	41.50 ± 3.27	NS

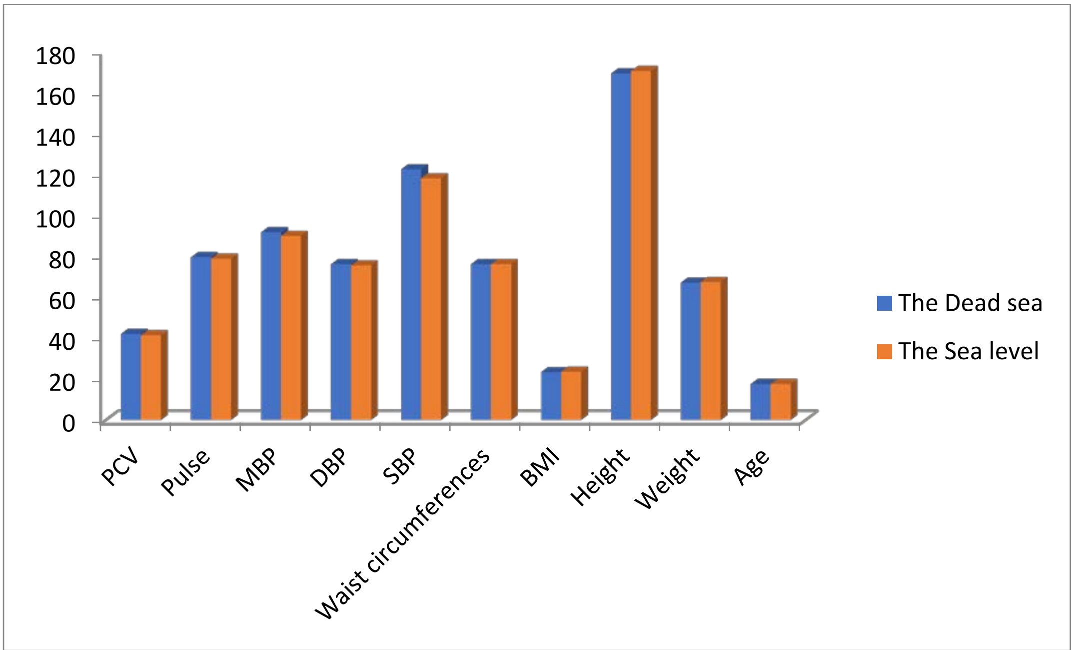

Figure 1: The means of study variables between study areas

The level of Angiotensin II among study participants in study areas

As seen in table 2 and figure 2, the mean of angiotensin II among participants in the area of the Dead Sea was 8.84 ± 4.65pg/ml and this was lower than that of the area of the Sea level (11.21± 6.05pg/ml). The difference in the mean of the two study areas was not statistically significant ($p>0.05$).

Table 2: Comparison between Angiotensin II Concentration in Dead Sea and Sea level Areas.

Target Area	Mean ± std	Target Area	Mean ± std	P value
Dead Sea	8.84 ± 4.65	Sea level	11.21± 6.05	NS

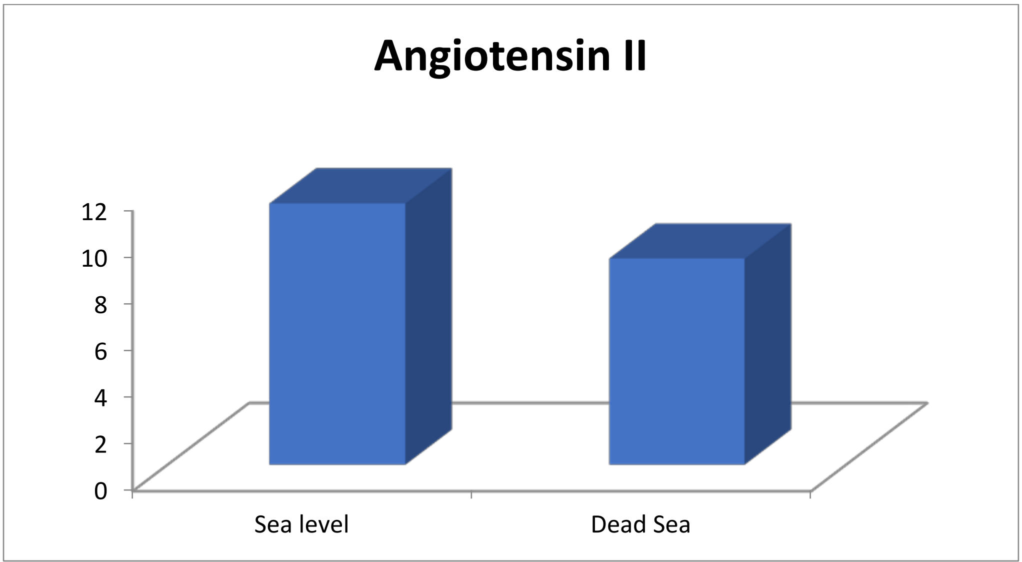

Figure 2: The level of angiotensin II in study areas Discussion

The present study was conducted to examine the effect of living in the lowest part in the world, the Dead Sea, located in Jordan and to compare that with living at the Sea level area in Jordan, and to explore the potential of having impacts on the choice of anti-hypertensive drugs.

The results of our study have shown that there were no significant differences in the mean for personal variables including age, height, weight, BMI, and waist circumferences (p>0.05). It can be included that these variables have no impacts in hypertension variables.

Our findings showed that SBP and MBP were higher in the Dead Sea area than the Sea level area significantly (p=0.001). Actually, these findings are not consistent with other studies which showed increased blood pressure variables with altitude (Wolfel et al., 1985; Brito et al., 2007). It seems that the altitude difference was not enough to exert hypoxic effect which is reflected by having no significant difference in the mean of PCV in study areas. Accordingly, we may agree with the results of Luks study (2007) in which he pointed to poor mechanisms explaining the effects of altitude on hypertension.

The level of angiotensin II was higher in the Sea level area than in the Dead Sea, but not significantly (p>0.05). Other studies have confirmed the effect of altitude on increased the level of angiotensin II (Parati et al., 2014). We think that the altitude in this study was not enough to induce significant changes in the level of angiotensin II, and again we agree with Parati et al., 2014.

Conclusions: although the level of angiotensin II was not significantly varied between the study areas, but its trend was to be higher in the Sea level area. It was surprised to have higher levels of SBP and MBP in the Dead Sea rather than the Seal level area. It can be implied that the therapeutic options of hypertensive drugs follow different patterns independent of angiotensin II pathways.

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