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Male Partner of the Couples with Unexplained Infertility Have Increased Blood Pressure as Compared to the Female Partner

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Abstract

Introduction: Arterial blood pressure, an important physiological parameter has great etiological significance in epidemiology of cardiovascular disease due to its association with age, height, weight, diet, stress, socio-economic status. Reactive Oxygen Species (ROS) are ubiquitous reactive derivatives of O2 metabolism found in the environment and in all biological systems. ROS are implicated in many intracellular signaling pathways leading to changes in gene transcription and protein synthesis and consequently in cell function. Within the cardiovascular system, ROS play a crucial physiological role in maintaining cardiac and vascular integrity and a pathophysiological role in cardiovascular dysfunction associated with several clinical conditions, including hypertension. ROS is generated by psychological and physical stress they are involved in the cardiovascular dysfunctions and also in the male and female infertility, therefore it is hypothesised that the blood pressure may be one of the cardiovascular parameter that may be affected in both the partners of the couples suffering with unexplained infertility. Therefore, this study was undertaken to assess the blood pressure in both partners of the couples with unexplained infertility and to compare the blood pressure in both the partners. *Materials and Methods:* The blood pressure was recorded using the standard auscultatory technique in both the partners of 50 couples with unexplained infertility and having all the investigations within normal limits. The data obtained was analyzed statistically using student's t- test. *Results*: The mean age of the male partners was 33.1±7.4 years and female partners was 31.3±3.6 years. The significant increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP) was observed in the male partners. *Conclusions*: The male partners of the couples with unexplained infertility have elevated blood pressure as compared to the female partners.

Keywords: Increased Blood Pressure; Male Partner; Unexplained Infertility.

Introduction

Arterial blood pressure, an important physiological parameter has great etiological significance in epidemiology of cardiovascular disease due to its association with age, height, weight, diet, stress, socio-economic status etc [1]. Familial aggregation of hypertension documents an important genetic component. Concordance of blood pressure is greater within families than in unrelated individuals, greater between monozygotic than between dizygotic twins and greater between biological than between adoptive siblings living in same household. About 70% of familial aggregation of blood pressure is attributed to shared genes rather than shared environment [2]. Hypertension has been reported to be generally associated with sympathetic overactivity [3]. But the sympathetic response of certain individuals from both normotensive and hypertensive population have been reported to be more pronounced. Previous studies of family history of patients with hypertension have shown a hereditary factor in 76-86% of cases [4].

Reactive Oxygen Species (ROS) are ubiquitous reactive derivatives of O2 metabolism found in the environment and in all biological systems. ROS are implicated in many intracellular signaling pathways leading to changes in gene transcription, protein synthesis and consequently in cell function. Within the cardiovascular system, ROS play a crucial physiological role in maintaining cardiac and vascular integrity and a pathophysiological role in cardiovascular dysfunction associated with several clinical conditions, including hypertension [5,6]. The

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most important ROS detectable within the vasculature include the superoxide anion ($\bullet O_2^-$), hydrogen peroxide (H_2O_2), hydroxyl radical ($\bullet OH$), and the reactive nitrogen species peroxynitrite ($ONOO^-$), which have been regarded as a nasty, life-threatening and destructive oxygen-derived toxicant. In healthy conditions, ROS are produced in a controlled manner at low concentrations and function as signalling molecules regulating vascular contraction-relaxation and cell growth [7].

Physiologically, ROS generation is tightly regulated by endogenous cellular antioxidants, which include superoxide dismutase (SOD), catalase, thioredoxin, glutathione, and antioxidant vitamins. In physiological conditions, the rate of ROS generation is counterbalanced by the rate of elimination. In contrast, under pathological conditions, such as hypertension, ROS are produced in concentrations that cannot be controlled by the usual protective antioxidant mechanisms employed by the cells, leading to a state of oxidative stress [6].

Indeed, when produced in excess, $\bullet O_2^-$ reacts with nitric oxide (NO) to produce a dramatic concentration of the toxic $ONOO^-$ which promotes a variety of negative effects on cellular function. These include alteration of transcription factors, kinases, protein synthesis, and redox-sensitive genes, which in turn influence endothelial function, increase vascular contractility, vascular smooth muscle cell growth and apoptosis, monocyte migration, lipid peroxidation, inflammation, and increased deposition of ECM proteins. These major processes are deeply involved in the pathogenesis and progression of vascular damage in cardiovascular disease [8,9].

As ROS is generated by psychological and physical stress. ROS are involved in the cardiovascular dysfunctions and also in the male and female infertility, therefore it is hypothesised that the blood pressure may be one of the cardiovascular parameter that may be affected in both the partners of the couples suffering with unexplained infertility.

Therefore, this study was undertaken to assess the blood pressure in both partners of the couples with unexplained infertility and to compare the blood pressure in both the partners.

Materials and Methods

The study was conducted in the Department of Physiology on the male and female partners of the couples diagnosed with unexplained inferility (having all the investigative reports within normal limits) referred from the outpatient department of the Department of Obstetrics and Gynecology, UPUMS, Saifai, Etawah.

After obtaining the informed written consent 50 couples were assessed during the study. The blood pressure was recorded using the standard auscultatory technique. The data obtained was analyzed statistically using student's t- test and p value of less than 0.05 was considered significant.

The study was approved by the institution ethical committee for research on humans.

Results

The mean age of the male partners was 33.1±7.4 years and female partners was 31.3±3.6 years. The blood pressures of both the partners are as given in Table 1. The significant increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP) was observed in the male partners.

Table 1:

	Female Partners (N= 50)	Male Partners (N=50)
PULSE (per minute)	73.6 ± 7.3	85.7 ± 8.1
SBP (mm Hg)	102.5 ± 6.1	*134.3 ± 9.8
DBP (mm Hg)	74.9 ± 7.4	*89.2 ± 8.1

*P< 0.05, student's t- test.

Discussion

The increased SBP and DBP as observed in the study (Table 1) was due to the fact that estrogen affect mitochondrial function in vascular endothelium [10]. Estrogen affects mitochondrial function through increasing oxidative phosphorylation, while at the same time decreasing mitochondrial superoxide production [11,12,13]. Mitochondrial production of ROS plays a key role in oxidative stress, so one would predict that estrogen may also have an important impact on vascular oxidative stress [14].

In addition to the mitochondria, estrogen also suppresses ROS through other mechanisms. For example, estrogen treatment reduces angiotensin II induced free radical production in vascular smooth muscle cells and decreases NADPH stimulated superoxide production by mouse cerebral arteries [15]. Estrogen also suppresses stress increased NADPH oxidase activity and intracellular generation of ROS in human umbilical vein endothelial cells [16]. Furthermore, in vascular smooth muscle cells estrogen treatment increases protein levels of both manganese superoxide dismutase (SOD) and extracellular SOD by increasing transcription rate. There was no effect of estrogen on copper-zinc SOD, glutathione peroxidase, or catalase. Likewise, treatment of ovariectomized rats with estrogen increased levels of manganese SOD protein in cerebral blood vessels, but did not change levels of catalase or glutathione peroxidase [10].

The most prominent effects of estrogen on vascular reactivity are mediated through direct effects on endothelial function [17], but studies of very high concentrations of estrogen may show additional, non physiological effects. A plethora of studies in humans have clearly demonstrated that estrogen promotes vasodilation through an Enos dependent mechanism [17]. These include demonstration of an estrogen stimulated increase in plasma concentrations of NO, increase in reactive hyperemia after estrogen treatment, and changes through the menstrual cycle reflective of an estrogenic effect. Interestingly, age influences flow mediated vasodilation in women. In one study acute responses of postmenopausal women to estrogen (18 h after placement of a transdermal patch) declined with age [18].

Likewise, postmenopausal women receiving either acute estrogen (within 1 h of sublingual administration) or chronic estrogen (3 months oral administration) all demonstrated increases in flow mediated dilation, but this increase was significantly greater in women who were less than 5 years past menopause compared with women more than 5 years past menopause [19]. Furthermore, for women more than 5 years past menopause, flow mediated vasodilation increased significantly more in women who had received estrogen treatment in the past compared with those who had not. These findings support the idea that, in the absence of estrogen, endothelium dependent release of NO is reduced, and the ability of estrogen to increase this response is abrogated the longer an individual is without estrogen exposure. Whether this abrogation involves epigenetic regulation of estrogen receptors or other mechanisms remains to be determined [19].

In contrast to what is known about the effects of estrogen on arteries, information regarding estrogenic effects on veins is scant. This lack of information is somewhat surprising in light of the well known adverse side effect of venous thrombosis in women using estrogenic treatments. As is observed in arteries, acute application of 17β estradiol in vitro caused concentration dependent and endothelium dependent decrease in tone in rings of femoral veins derived from female pigs.

These endothelium dependent relaxations to 17β estradiol were mediated by NO, but potassium channel activation seemed to contribute to the relaxation only in veins derived from gonadally intact females [20].

Conclusion

As there is significant increase in SBP and DBP observed in the male partners of the couples with unexplained infertility. Thus it is concluded that male partners have elevated blood pressure as compared to the female partners in couples with unexplained infertility .

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