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ASSESSMENT OF HEART FUNCTION TESTS IN GRAND MULTIPARITY PREGNANT SUDANESE WOMEN

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ABSTRACT

Grand multiparity is always a risk in pregnancy and is tied to a high prevalence of maternal and neonatal health issues compared with other multiparous. The study was performed to compare the concentrations of cardiac function lab tests in grand multiparas with nulliparas [control] and primiparas. A cross-sectional study was performed in 100 non-pregnant women as control group, 100 primiparity pregnant women, and 100 grand multiparity pregnant women. All pregnant women were between 20^{th} - 30^{th} weeks of gestation. High-sensitivity C – reactive protein [us-CRP], total homocysteine [Hyc] and creatine kinase-MB [CK-MB], total cholesterol [T.CHOL], as well as high density lipoprotein cholesterol [HDL-C] and Cholesterol/HDL ratio were measured. Multiparity pregnant ladies showed significant raise throughout the total blood cholesterol, CHOL/HDL ratio in addition to High-sensitivity C - reactive protein levels when compared to control and primiparity. On the other hand, high density lipoprotein-cholesterol and creatine kinase-MB of multiparity group increased significantly when compared to control group, but showed significant decrease as compared to primiparity. Homocysteine levels in multiparity group were increased significantly when compared to control group. The results suggest that grand multiparity increases the risk of pregnancy-related complication secondary to cardiac dysfunction.

Keywords: multiparas, us-CRP, homocysteine, cholesterol, HDL-C, CK-MB, CHOL/HDL ratio

INTRODUCTION

The grand multiparity is defined as parity starting from five since the risks of pregnancy problems, neonatal health issues, and even perinatal mortality increases clearly at the fifth parity or more (Mgaya *et al*., 2013) Increased parity together with decreased inter-pregnancy duration are known to be risk conditions for pregnancy outcome and imperfect perinatal. All these features might accumulate to make pregnant women susceptible to several health problems **(**Saadia, 2014). Pregnancy, itself, alters the levels of many circulating hormones, enzymes, and proteins produced and released from many organs (Holub and Camune, 2015). Grand multiparas are pregnant ladies at a risk to have multiple difficulties antepartum and intra-partum with disconcerting childbirth complications (Al, 2012). Not much is famous on the cumulative implications of numerous childbearing on future cardiac dysfunctions (Demirtas *et al.,* 2014). In the year 2011, advices on the avoidance of cardiac impairment in women identified pregnancy complications as sources for coronary heart disease. Gestational hypertension and pregnancy-related diabetes mellitus are independently involved in a raised10-year cardiovascular risk. Approximately 2% of pregnancies involve maternal cardiovascular disease, associated with increased risk to both mother and fetus (Carole, 2015).

Normal pregnancy places demand on the mother's heart, with her cardiovascular system needing to supply oxygen and nutrients to the growing fetus. The peripartum cardiomyopathy is a significant reasons for maternal and newborn morbidity and mortality globally, still its proper etiology continues to be unfamiliar. Recent research suggests multiparity is commonly reported to be a factor for the development of peripartum cardiomyopathy (Bello *et al.,* 2013).

Pregnancy is an active process linked with important physiological modifications in the heart. The entire body adapts to make these changes as a mechanism to fulfill the elevated metabolic needs of the mother and also fetus in order to provide sufficient uteroplacental circulation. Inadequate hemodynamic changes could cause maternal and fetal morbidity. Furthermore, maternal failure to adapt to these types of physiological variations should induce main, previously silent, cardiac pathology. Therefore some people name pregnancy nature's stress test (Sanghavi and Rutherford, 2014). The incidence of heart problems during pregnancy has been reported to vary by geographical location with rates ranging from 1:15,000 pregnancies in United States, to as 1:100 in a small region in Sub-Saharan Africa (Prasad *et al.,* 2014).

This study is designed to determine if there would be any changes in heart functions by measuring serum total cholesterol, high density lipoprotein [HDL-C], cholesterol:HDL ratio, high-sensitivity C - reactive protein [us-CRP], total homocysteine [Hyc] and creatine kinase-MB [CK-MB] in grand multiparas pregnant Sudanese women and to compare the results of these parameters with the results from age- and sex- matched primiparas [first time pregnancy] and apparently healthy individuals non-pregnant females [nulliparas, control]

MATERIALS AND METHODS

Study design: This research was constructed as a cross-sectional study.
Study area: This study was carried at three different centres; the Al-Ajyal hospital, the fertility Center of Dr. Suraj and Dr. Amel Hospital for Obstetrics and Gynaecology, all in Khartoum state (Sudan).
Study period: The study was carried between August 2014 and December 2016.
Study size: The study included 100 normal healthy non-pregnant women as control group [nulliparity], 100 pregnant women for the first time [primiparity], and 100 pregnant women for more than five times [grand multiparity]. All pregnant women were between 20^{th} - 30^{th} weeks of gestation during the time of collection of samples. Women on drugs that are known to have effect on the parameters being studied and/or with major hormonal disorders and those diagnosed with cardiac problems were not included in the study.
Sampling: Informed consent was obtained from all study participants. Pre-prepared questionnaire including data concerning patients and their pregnancy information [such as age, tall, weight, health condition, complications during this pregnancy, and number of pregnancies] was used. This study was permitted by the ethical committee of Omdurman Islamic University.

Seven milliliter of venous blood was obtained from each female using standard venipuncture technique in serum separator tubes [SST]. After 15 minutes, serum specimens were collected in dusky, new and clean container after centrifugation at 3000 rpm for five minutes. The serum containers were stored in - 4°C for less than five days for each patch. The serum then assayed for total cholesterol [T.CHOL], high density lipoprotein-cholesterol [HDL-C], ultra-sensitivity C - reactive protein [us-CRP], total homocysteine [Hyc] and creatine kinase-MB [CK-MB] by using commercially available kits--Roche/ Hitachi cobas systems (Roche Diagnostics, Germany) as manufacturer procedure.

Statistical analysis: The results were compared between multiparity with primiparity, multiparity with control, and primiparity with control. Statistical study was conducted by statistical package for social sciences [SPSS]. Statistical significance and alterations from control and test levels were calculated by student *t*-test, at which the p value of less than 0.05 considers the significance.

RESULTS

The T.CHOL, T.CHOL/HDL ratio and us-CRP levels were increased significantly in both groups of pregnant ladies compared with control group, also showed significant increase in multiparity in comparison to primiparity. On the other hand, HDL-C and CK-MB increased significantly in pregnant ladies in comparison to control group, also showed significant increase in primiparity in comparison to multiparity. Also Hyc levels were increased significantly in both groups of pregnant ladies when compared to control group (Table 1).

Table 1. Comparison of cardiac function tests levels between control and Primiparity.

Group	Control	Primiparity	Multiparity
Number	100	100	100
Age (years) [c]	30.25 ± 5.025	28.750 ± 4.499	32.50 ± 5.715
BMI [a, b, c]	22.301 ± 1.055	24.158 ± 6.394	28.729 ± 4.915
T.CHOL [a, b, c]	126.78 ± 10.781	208.34 ± 15.773	229.36 ± 13.254
HDL [a, b, c]	46.672 ± 8.131	49.804 ± 8.799	47.291 ± 8.146
T.CHOL/HDL ratio [a, b, c]	2.716:1	4.756:1	5.555:1
us-CRP mg/L [a, b, c]	0.3550 ± 0.01	1.014 ± 0.35	1.172 ± 0.411
Hyc µmol/L [a, b]	4.172 ± 0.9270	6.637 ± 2.810	6.912 ± 3.001
CKMB ng/mL [a, b, c]	2.944 ± 1.0	4.007 ± 1.822	3.892 ± 1.055

The results were expressed as Mean ± SD; a: P value < 0.05 when compared Control results with Primiparity results; b: P value < 0.05 when compared Control results with Multiparity results; c: P value < 0.05 when compared Primiparity results with Multiparity results.

DISCUSSION

Many studies tried to associate parity with the risk of cardiac problems in pregnant women but the reports were conflicting partly due to residual confounding from socioeconomic situation with age that influences childbearing pattern along with the health problems risk. Furthermore, determines of pre-existing risk variables for heart disorder (overweight, hyperlipidemia, and hypertension) together with the converts in risk factors within the a single pregnancy never have collected prospectively to distinguish pregnancy-specific symptoms from those related to conventional and accustomed trends, aging, with modifications in attitudes (Akter *et al.,* 2013).

In the present study, total cholesterol level in multiparity showed significant increase when compared to controls as well as primiparity ($P < 0.001$). Also, cholesterol levels in primiparity group were increased significantly when compared to controls ($P < 0.05$). These findings were in line with Rebholz *et al.* (2012) who stated that multiparas is associated with increase in plasma total cholesterol as well as HDL-C. Rebholz *et al.* (2012) results were also concurred our results of HDL-C, in which, levels in multiparity increased significantly when compared to controls ($P < 0.05$), but primiparity group displayed significant higher result in comparison to multiparity ($P < 0.05$). Prairie *et al.,* (2012) reported that HDL-C levels in primiparity are more than in multiparity.

T.CHOL/HDL ratio in this study was increased significantly in pregnant women comparing to controls ($P< 0.001$), also, the ratio showed significant increase in multiparity comparing to primiparity ($P < 0.05$). Despite the fact that rising of T.CHOL/HDL-C ratio predicts heart disease, Wu *et al.* (2015) reported that ratio above 5.8:1 is index to ischemic heart disease. On the other hand, Hyc levels in both groups of pregnant women were increased significantly when compared with controls; not withstanding Hyc levels were insignificantly higher in multiparity than in primiparity.

These findings could be explained by two different reports; Varga *et al.* (2005) who stated that Hyc can be elevated due to hypothyroidism and Abdelsalam (2015) reported multiparity women are characterized by hypothyroidism. Basing on that, elevation of Hyc is common in pregnant women, although whether it is cause or effect is still a matter of debate.

In the present study, CK-MB levels were similar to levels of HDL-C, showed a significant increasing in pregnant women in comparison to controls and primiparity levels of HDL-C were raised significantly in primiparity when compared to multiparity. Soundravally *et al* (2013) reported that the elevated CK-MB during pregnancy should not be due myocardial infarction for CK-MB is found not only in myocardium but also in uterus and placenta.

Conclusion

Grand multiparity is a high-risk obstetric condition most likely to promote numerous antepartum and intra-partum difficulties with adverse neonatal outcome. Multiparity on long-term can increase the risk for coronary heart disease, because its association with many metabolic changes, all increase risk of coronary heart disease, such as dyslipidemia, obesity along with the age of woman. Grand multiparity revealed significant increase of T.CHOL, T.CHOL/HDL ratio and us-CRP levels when compared to primiparity and control.

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