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Parity, duration of lactation and prevalence of maternal metabolic syndrome: a cross-sectional study

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ABSTRACT

Objective: Pregnancy is associated with insulin resistance in tissues. Although this condition is resolved after termination of pregnancy, subtle metabolic changes can remain and prompt incidence of metabolic syndrome. However, lactation causes increased metabolic load and energy needs and it may confer with unfavorable effects of pregnancy in metabolic status. We conduct this study to evaluate impacts of lactation on development of metabolic syndrome (MetS) among women.

Study design: In this cross-sectional study, we enrolled 978 women aged between 40 and 70 years who had at least one previous live birth, referred to population research center of Amol, Iran in 2011. We surveyed medical registries of participants of Amol health cohort and filled the checklist we had designed for our study. The checklist included main variables like age, number of pregnancies, life-time lactation duration, waist size, systolic and diastolic blood pressures, blood triglyceride level, and blood glucose level.

Results: We included 978 women among which, the mean age of participants was 53.24 ± 7.8 years. Calculated odds ratio (OR) for relationship of number of parities and metabolic syndrome (OR = 1.14 [95% CI = 1.02–1.28] p-value = 0.017) was found to be statistically significant. However, calculated odds ratio for relationship of lactation duration and MetS (OR = 0.99 [95% CI = 0.99–1.00], p-value = 0.322) was not statistically meaningful. Moreover, we calculated OR and Pearson correlation coefficient in different strata of number of parities, none of which were statistically significant and hence did not support protective roles of lactation in development of metabolic syndrome.

Conclusions: Our data did not support protective roles of lactation in development of metabolic syndrome, since in our study longer lactation durations as well as higher number of parities were seen among participants with metabolic syndrome.

Introduction

Metabolic syndrome (MetS) is defined as collection of multiple abnormalities including abdominal obesity, hypertriglyceridemia, low levels of high-density lipoprotein (HDL) cholesterol, impaired fasting blood glucose, and hypertension. Furthermore MetS is associated with several complications, since it increases risk of cardiovascular diseases, diabetes mellitus (DM) and also several other chronic diseases [1–5]. Moreover, MetS may cause increased rates of all-cause mortality among patients [6]. Prevalence of this syndrome has increased recently and it is estimated that current prevalence of MetS has reached 25% of world's population [7].

Pregnancy and its altered hormonal status are associated with insulin resistance in tissues [8]. Although this condition is resolved after termination of pregnancy, subtle metabolic changes can remain and prompt development of MetS and DM in the future [9]. Conversely, since lactation causes increased metabolic load and energy needs, it may confer with unfavorable effects of pregnancy in metabolic status of women. Studies have shown associations between lactation and weight loss, increased HDL levels, decreased blood triglyceride levels, improved insulin

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resistance, decreased incidence of type 2 DM, and lower prevalence of hypertension [10–12]. Moreover, several studies have shown that lactation may lower development of MetS in women and longer durations of lactation have been shown to decrease development of MetS significantly [13,14]. However, lactation was not associated with decreased development of MetS after 3 years of pregnancy termination in a prospective cohort of parous women [15]. Furthermore, this study did not support persistence of beneficial impacts of lactations on maternal metabolism further than weaning. Controversial effects of lactation on MetS and mechanism behind them are yet to be fully clarified.

Several studies have considered effects of lactation on incidence of MetS in women. However, since racial differences, demographic characteristics and health behaviors may modulate effects of lactation on MetS, we conducted this cross-sectional study to investigate associations between pregnancy, lactation and duration of lactation with MetS in women of a rural and urban population of Iran.

Materials and methods

Study population

This study was conducted as a part of a health cohort from 2008 to 2011, by Gastrointestinal and Liver Disease Research Centre (GILDRC) on the rural and urban inhabitants of Amol city. Amol is a large city in Mazanderan province in north of Iran, which has both urban and rural areas. Urban areas were defined as municipal zones, and rural ones were those with agricultural areas. Since, migration rates in this city are evaluated to be low, ethnicity of Amol inhabitants has remained mostly unchanged. In this cross-sectional study, we enrolled 978 women aged between 40 and 70 years who had at least one previous live birth, referred to health centers of Amol in 2011. Each health center deliver services to approximately 30 families. In this study, each health center was considered as a cluster and clustered random sampling method was used to collect participants. Details about Amol health cohort has been described elsewhere [16].

Written, informed consent was obtained from all participants and also the project was approved by the Medical Ethics Committee of Iran University of Medical Sciences and local ethics committee. All research steps were done according to Helsinki ethics declaration and medical ethics rules approved by Ministry of Health and Medical Education of Iran.

Measurements and definitions

We surveyed medical registries of participants in Amol health cohort and filled the checklist we had designed for the study. The checklist included information about main characteristics of participants like age, level of education, number of pregnancies, type of delivery, life-time lactation duration after all deliveries (by month), waist size, systolic and diastolic blood pressures, blood triglyceride level, HDL level, blood glucose level, and taking medications or treatments for hypertension. Filled checklists were re-checked by another assessor, as well.

Blood pressure (BP) of participants was measured in sitting position following 5 min of relaxation. Subjects taking antihypertensive medications or those with systolic or diastolic blood pressure of higher than 140 and 90 mmHg, respectively, were considered as hypertensive cases. Venous blood sample was taken following at least 8-hours of fasting to assess fasting plasma glucose (FPG) and lipid profile of participants. Diabetes mellitus was defined as FPG more than 126 mg/dl or receiving anti-hyperglycemic drugs. Waist circumference was measured halfway the lower costal margin and the iliac crest and the records were rounded to the nearest 0.5 cm.

Patients' information was checked with the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII) guidelines to assess diagnosis of MetS [17]. According to the revised NCEP ATPIII criteria, having at least three of the following items is diagnosed as MetS:

1. *Central obesity*: waist circumference greater than 88 centimeter (cm),
2. Hypertriglyceridemia: blood triglyceride level more than 150 milligram per deciliter (mg/dl) or being under anti-hypertriglyceridemia medical therapy,
3. Low HDL cholesterol: blood HDL levels lower than 50 mg/dl,
4. Systolic blood pressure more than 130 mmHg or diastolic blood pressure more than 85 mmHg or being under anti-hypertensive treatment,
5. Impaired fasting blood glucose: FPG greater than or equal to 100 mg/dl.

Statistical analysis

Data was analyzed using SPSS (Statistical Package for the Social Sciences), version 22. Continuous variables are reported as mean ± standard deviation (SD) and categorical ones are shown as frequency (percent). Student's *t* test and analysis of variances (ANOVA) were applied to compare study variables between different groups of participants based on their diagnosis of MetS. Moreover, Pearson correlation coefficient was calculated to assess strength of correlations between MetS and its subcomponents (hypertension, central obesity, impaired fasting blood glucose, Low HDL level and hypertriglyceridemia) with lifelong lactation duration and number of parities. A multivariable binary logistic regression model was built to evaluate effects of lactation duration on development of MetS. Several variables (age, age at first pregnancy, duration of lactation, number of pregnancies and histories of DM and hypertension) were entered in the model. *p*-values lower than 0.05 was considered as statistically significant in this study.

Results

We included 978 women with history of at least one live birth in this study. The mean age of participants was 53.24 ± 7.85 years, which was significantly higher in the group of patients with MetS. The mean body mass index (BMI) of women in our study was 31.41 ± 5.19 kg/m^2. Among participants, 306 (31.3%) and 380 (38.9%) of the women had histories of hypertension and DM, respectively. Our results showed that MetS is associated with levels of participants' education, however, MetS prevalence was not significantly different between groups of patients based on their types of deliveries. Demographic characteristics of participants and their associations with MetS are shown in Table 1.

Mean age at first parity was 19.27 ± 4.13, mean number of pregnancies was 4.71 ± 2.26 and the mean duration of lactation was 81.55 ± 51.22 months in the study population (Table 1).

There were 762 (77.9%) women with waist sizes greater than 88 cm and 534 (54.6%) cases had high blood pressure or were diagnosed with hypertension in our study. Also 398 (40.7%) patients had high TG levels and 660 (67.5%) numbers were reported to have HDL levels under 50 mg/dl. Four hundred and fifty-three (46.3%) of participants were diagnosed with high fasting plasma glucose levels or diabetes. Among participants, 640 (65.4%) cases met the criteria of MetS.

Pearson coefficient was calculated to assess correlation strength between study variables. Number of pregnancies and