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Influence of early feeding practices on biomarkers of cardiovascular disease risk in later life

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ABSTRACT

Background: An analysis of risk factors linked to ischemic heart disease (IHD) shows a strong link between these risk factors and early feeding practices.

Aim of the work: The aim of this study was to evaluate cardiac biomarkers that could predict cardiovascular disease (lipid profile and highly sensitive C-reactive protein (hs-CRP) for both mothers and their children and demonstrate their associations with early feeding practices.

Methods: This was a cross-sectional study comprising one hundred twenty pairs of mother and their children, one half of whom were exclusively breastfed for 6 months, the other half their children were formula fed from birth. The groups were matched for age and sex. Full feeding history was taken for children and assessments of risk behaviour of cardiovascular disease including Anthropometric measurements to assess Body Mass Index, blood pressures and blood samples for lipid profile and hs-CRP for both mothers and children.

Results: There was a statistically significant difference between the two groups regarding hs-CRP as it was higher in mothers and their children who were artificially feed than mothers and their children who were breastfeed ($m = 3.3 + 2.2 - 1.72 \pm 1.96$, $2.08 \pm 1.64 - 0.84 \pm 1.09$ respectively), however there was no a statistically significant difference for both mothers and their children regarding lipid profile.

Conclusion: Early feeding practices can influence the development of cardiovascular diseases as breast fed infants and their mothers had lower hs- CRP levels which is considered as a biomarker of CVD risk.

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Introduction

Cardiovascular diseases represent one of the major causes of death in the world particularly ischemic heart disease (IHD) is the mean cause of death according to the global burden of disease in 2014. Ischemic heart disease is the mean cause of death in Egypt. Risk factors and risk behaviors that enhance development of atherosclerotic heart disease begin in childhood, and reduction of these risk factors delays progression of the disease.¹

A recommendation of world Health Organization (WHO) is that infants should be exclusive breastfed up to six months after birth and to continue breastfeeding for two years with complementary foods. Exclusive Breastfeeding not only reduces communicable disease in infancy but also protects against negative health outcomes

such as obesity with its complications on the cardiovascular system in adulthood.²

Numerous studies have suggested that breastfeeding in infancy may have protective effects on the development of cardiovascular disease (CVD) risk³ and hence CVD risk in adulthood.⁴ Breastfeeding in infancy may lead to small reductions blood pressure levels, also decreased total cholesterol and low density lipoproteins (LDL) cholesterol levels in adulthood and slightly decreases in adult body mass index (BMI).⁴

Previous studies have been limited due to there was no correlation between breastfeeding and cardiovascular disease due to potential maternal and offspring confusion factors including socioeconomic status.⁵ Although the Nurses' Health Study did not demonstrate a significant association between breastfeeding and BMI upon adjustment for socioeconomic status.⁶ Detailed verification of risk factors, collection of social and demographic data, and breastfeeding report for mothers, through Framingham Heart Study Offspring mothers, and their adult children, in the Third Generation cohort provided an opportunity to expand the data

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analysis. They found an link between breastfeeding in infancy and several risk factors for cardiovascular disease in adulthood.⁶

CVD is the main cause of death in females in developed countries. As such, it is important to identify behaviors that modify women's risk of CVD. Diet and exercise are widely known to impact CVD, but less is known about the impact a woman's decision to breastfeed her babies may have on her future risk of cardiovascular disease.⁷ While advantages of breastfeeding is widely known to benefit infant health, in 2014, only 13.6% of Egyptian mothers were fed their babies exclusively in the first six months of the babies life.⁸

The controversy in the findings of links between CVD and breastfeeding practices of infants and their mothers has stimulated this study. The aim of this study is to study the effect of early feeding practices in infancy on lipid profile and highly sensitive C-reactive protein (hs-CRP), as predictors of risk to cardiovascular disease (CVD), for both mothers and their children.

Patients and methods

This is comparative, cross sectional, observational study that was conducted for 120 pairs of mothers and their preschool children aged 2–6 years. They were recruited from both private and public sectors, from Cairo Governorate during the period from March 2016 to February 2017. They are classified as per early feeding practices as follows:

Group 1a children who had never been breastfed.

Group 2a mothers of the children who had never been breastfed.

Group 1b children who were breastfed in the first 6 months of life.

Group 2b mothers of the children who were breastfed in the first 6 months of life.

Ethical considerations

The study was approved by the Ethical Scientific Committee of Benha University and was carried out according to the guidelines of the Helsinki Declaration.⁹ Mothers recruited agreed informally to the protocol of the study and the purpose and the results of the analysis were explained to them.

Inclusion criteria

Children 2–6 years of age.
Apparently healthy children.
Apparently healthy mothers.

Exclusion criteria

Family history of chronic diseases as hypertension, diabetes mellitus (DM), heart disease, liver disease and renal disease.

Intake of medications for chronic illness.

Past history of major operation and blood transfusion

1. **Methodology:** All mothers were interviewed for their knowledge about benefits of breastfeeding by using questionnaire previously designed and tested for that purpose. This questionnaire designed and translated into Arabic for consistency purposes (WHO/UNICEF 2009, breastfeeding questionnaire),¹⁰ to obtain accurate data questions were repeated with different ways with avoidance of leading questions to insure right answers.

The questionnaire included personal data for mother as age, residence, education and working status, also working status of the father. The mother was assessed for antenatal visits and whether topics related to childbirth and breastfeeding were discussed with them to prepare them for successful breastfeed-

ing. The mother was asked about her birthing experience including the type of delivery, how long after birth did she first hold her baby, help with the first breastfeeds, milk expression and on demand feeding, exclusive breastfeeding for the first six months, supplements, artificial nipples, referral for support and education material about breastfeeding.

The second part of the questionnaire covered risk of cardiovascular affection including age of complementary foods, types of foods and mode of feeding, duration of continued breastfeeding, home foods (with salt) introduced, junk foods and fast foods introduced, milk introduced, sugars, exposure to cigarettes or shisha, gas emissions, chemicals, cleaners, pesticides, petrochemicals, paints, exhausts, stress, exercise, hours of sleep, sleep apnea, insomnia, difficulty falling asleep or interrupted sleep, abdominal pain, gas, bloating, diarrhea, constipation, straining when passing bowel motions, excessively smelly stools and/or a feeling that your bowels do not completely empty, oral contraceptive pills for more than 6 months in the last year also, whether the mother experiences wheezing, or other allergic manifestations or heart problems. Also type of foods she eats, fruits, fish, vegetables, sugars, cups of coffee soft-drink and water.

2. **Clinical assessment after thorough examination of child and mother:**

a. General, chest, cardiac, abdominal examination.

b. Anthropometric measurements for the mother and child included body weight (wt) measured to nearest 1 kg using regularly calibrated scale; standing height (ht) measured to the nearest mm using standard methods. Calculation of body mass index (BMI) = body weight (kg)/square of standing height (m²) WHO growth charts 2006.¹¹

c. Measurement of blood pressure for both mothers and their children using mercury sphygmomanometer with suitable cuff.

3. **Laboratory studies:** All mother and children underwent laboratory assessment for Low density lipoprotein (LDL) by colorimetric methods; High density lipoprotein (HDL) by colorimetric methods and highly sensitive C-reactive protein (hsCRP) by turbidimetric assay.

Statistical analysis

The findings were statistically analyzed using STATA/SE version 11.2 for Windows (STATA Corporation, College Station, Texas). Continuous data were expressed as the mean \pm SD and range, and categorical data were expressed as a number and percentage. Student *t*-test (*t*) was used to compare two groups of normally distributed data. One Way Analysis Of Variance (ANOVA; *F*) was used to compare more than two groups followed by post-hoc tests using the Bonferroni method to detect differences in pairs. The Pearson correlation coefficient was used to test correlations between the estimated parameters. Percent of categorical variables were compared using the Chi-square (χ^2) test and Fisher's Exact Test as appropriate. After the calculation of each of the test statistics, the corresponding distribution tables were consulted to get the "P" (probability value). Statistical significance was accepted at P value <.05 (S). A P value <.001 was considered highly significant (HS) while a P value >.05 was considered non-significant.

Results

The present study included 120 pairs of mothers and their preschool children aged 2–6 years. They were divided into four groups: **group 1a:** children who had never been breastfed, 24

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