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Effects of Prenatal Factors on the Health of Kuwaiti Infants

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Abstract:

A questionnaire seeking details about a large number of prenatal parental factors and symptoms suffered by infants was randomly distributed to 1,000 mothers throughout Kuwait. A

total of 690 fully completed questionnaires were returned and analysed by t-tests and one-way analysis of variance (ANOVA) as appropriate. There were several significant correlations ($p < 0.05$), including between male gender and increased skin problems; higher birthweight and increased skin problems; mother's age and respiratory problems; outside employment of mother and fewer neurological problems; father's age and neurological problems; low family income and increased digestive problems; previous abortion and greater neurological problems; maternal pregnancy-related problems and increased digestive, skin and respiratory problems; obesity and fewer skin problems; paracetamol or antibiotic use and increased digestive problems; epilepsy drug use and more skin problems but fewer respiratory problems; diabetic drugs and fewer neurological and skin problems; greater rates of skin problems with consumption of nuts; increased respiratory symptoms with carbonated soft drink consumption; increased

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neurological and respiratory problems with consumption of ready-made soups; and fewer skin problems with consumption of herbal drinks. This information may help identify parental factors that deserve further research.

Key words: prenatal factors; parental factors; infant health

Introduction:

Numerous factors are known to influence in utero development. In addition to congenital infections, any febrile illness (Botto et al., 2001; Botto et al., 2002), hypertension, diabetes, coronary heart disease and stroke (Newnham, 2001), and maternal asthma (Murphy et al., 2002) have all been linked to adverse effects. Almost any drug that can cross the placenta, whether prescription, over-the-counter or recreational, has some potential to impact the foetus and cause continuing effects in the infant.

Candy and co-authors (Candy et al., 2001) list the following adverse influences on the foetus: maternal age and parity, socioeconomic factors, single parenthood, employment, therapeutic drugs, drugs of abuse, alcohol, smoking and congenital infections. Similarly, the Children, Youth and Women's Health Service (2010) includes alcohol, smoking, caffeine, prescription medicines, over-the-counter medicines, illicit drugs and foods as possible risk factors in pregnancy. The present study population is unique in that usage of alcohol, tobacco and drugs of abuse is absent.

In recent times, there has been considerable interest in investigating the long-term consequences of early nutrition. Examples of this are the Early Nutrition Programming Project (EARNEST) (2010) coordinated by Professor Koletzo of the Children's Hospital, University of Munich, and the French EDEN program (Charles et al., 2003).

To gain some understanding of the possible effects of certain variables on Kuwaiti infant health,

mothers were queried about prenatal practices and any symptoms shown by their infants.

Methods:

A questionnaire was prepared to gather details of symptoms suffered by each infant and parental factors that may have contributed to their development. The questionnaire was reviewed by four specialists in health education, nutrition education, statistical analysis and psychology. The validity and constancy of the final questionnaire were tested on a sample of 40 mothers. A total of 1,000 questionnaires were randomly distributed to mothers with children under 18 months of age through various women's organizations, colleges and private and governmental work areas. Of these, 690 fully completed questionnaires, involving 690 each of mothers, fathers and infants, were returned and analysed.

Results:

Fifty-nine (8.6%) of mothers were <20 years old, 259 (37.5%) were 20-25 years, 194 (28.1%) were 26-30 years, 106 (15.4%) were 31-35 years, and 72 (10.4%) were >35 years. Nearly a quarter (165, 23.9%) of the women had a secondary qualification or less, 186 (27%) had a diploma, and 339 (49.1%) had earned a bachelor degree or higher. The majority of mothers (415, 60.1%) currently worked, while 153 (22%) carried out domestic duties, and 122 (17.7%) were students.

Fathers tended to be older than mothers; 119 (17.2%) were 20-25 years old, 245 (35.5%) were 26-30 years, 165 (23.9%) were 31-35 years, and 161 (23.3%)

were > 35 years. On average, they were also less educated than their wives, with 267 (38.7%) having a secondary qualification or less, 174 (25.2%) a diploma, and 249 (36.1%) a bachelor degree or higher.

Family income was fairly low, with 366 families (53%) having income < KD1,000; 207 (30%), KD1,000-1,500; and 117 (17%), > KD1,500.

Overall, a majority (414, 60%) of the women in the study reported suffering from one or more pregnancy-related problems, including morning sickness in 208 (30.1%), anaemia in 198 (28.7%), obesity in 67 (9.7%), gestational diabetes in 51 (7.4%), early delivery in 47 (6.8%), uterine bleeding in 41 (5.9%), preeclampsia in 8 (1.2%), and others in 106 (15.4%).

Nearly a third (203, 29.4%) of the mothers took a prescription or over-the-counter medication during their pregnancy; 126 (18.3%) took paracetamol, 53 (7.7%) an antibiotic, 32 (4.6%) a laxative, 14 (2.0%) a drug for diabetes, 14 (2.0%) a drug for hypertension, 6 (0.9%) a drug for epilepsy, and 40 (5.8%) some other drug.

A large majority of the women ate meat (65.1% always, 26.7% sometimes), fresh vegetables (45.1% sometimes, 41% always), fresh fruits (45.7% sometimes, 38.1% always), fried foods (50.6% sometimes, 31.6% always), sweets (50.7% sometimes, 26.7% always), chocolate (45.9% sometimes, 28.4% always), and salty foods (43.2% sometimes, 29.9% always).

A quarter (174, 25.2%) of the women ate fish at least weekly, while 252 (36.5%) ate it occasionally and 264 (38.3%) did not eat it at all.

The vast majority (610, 88.4%) of the women drank tea or coffee during pregnancy: 319 (53.2%) once or twice a day, 259 (42.5%) 3-5 times a day and 32 (5.2%) > 5 times a day.

At the time of the survey, 90 (13%) of the infants were < 6 months old, 176 (25.5%) were 6-12 months, 206 (29.9%) were 12-18 months, and 218 (31.6%) were >18 months. In 263 cases (38.1%), it was the first child; in 144 (20.9%), the second; in 98 (14.2%), the third; and in 185 (26.8%), the fourth. Roughly half (348, 50.4%) of the infants were male, and 342 (49.6%) were female.

The birth weights of the infants included an unusually high number of low values, with 97 (14.1%) of the neonates weighing <2.5 kg; 377 (54.6%), 2.5-3 kg; 184 (26.7%), 3-4 kg; and 32 (4.6%), >4 kg. At the time of the survey, 36 (5.2%) weighed <4 kg; 264 (38.3%), 4-9 kg; 267 (38.7%), 9-12 kg; and 123 (17.8%), >12 kg.

Digestive disorders were the most common health problems experienced by the infants, with 523 (75.8%) experiencing at least one symptom. Among these, 251 (36.4%) experienced 1; 1138 (20%), 2; 75 (10.9%), 3; 36 (5.2%), 4; and 23 (3.3%), 5. These included gas and bloating reported for 250 (36.2%), lack of increase in body weight in 182 (26.4%), constipation in 149 (21.6%), diarrhoea in 139 (20.1%), vomiting or nausea in 95 (13.8%), excessive saliva in 95 (13.8%), and indigestion in 80 (11.6%).

Respiratory problems were experienced by 319 (46.2%) of the infants, with 198 (28.7%) having 1 symptom; 78 (11.3%), 2; 25 (3.6%), 3; and 18 (2.6%),

4. These included asthma in 115 (16.7%), repeated ear infections in 92 (13.3%), continuous coughing in 63 (9.1%), watering eyes in 58 (8.4%), difficulty breathing in 57 (8.3%), and excessive sneezing in 26 (3.8%).

Neurological problems were observed in 315 (45.7%) of the infants, with 211 (30.6%) having 1 manifestation, 78 (11.3%) 2, and 26 (3.8%) 3. These included difficulty sleeping in 103 (14.9%), hyperactivity in 67 (9.7%), excessive thirst in 29 (4.2%), excessive yawning in 23 (3.3%), and fatigue in 8 (1.2%).

Skin problems were reported for 197 (28.6%) infants, with 157 (22.8%) experiencing 1 symptom and 40 (5.8%) 2. These were eczema in 124 (18.0%); diaper rash in 122 (17.7%); rash on the face in 87 (12.6%); excessive earwax in 73 (10.6%); and inflammation of lips, lids, hands or feet in 7 (1.0%).

Correlations between risk factors and symptoms are shown in Table 1.

Table (1)
Correlations of symptoms with various risk factors

	Digestive	Neurological	Skin	Respiratory
Sex of child	NS	NS	Male S↑	NS
Birthweight	NS	NS	↑ greater weight	NS
Caesarean/vaginal delivery	NS	NS	NS	NS
Mother's age	NS	NS	NS	S↓ <20- 30y S↑ 31- >35y
Mother's education	NS	NS	NS	NS
Mother's working status	NS	Housewife S↑ Employee S↓	NS	NS
Father's age	NS	S↓ <20- 35y S↑ 31- >35y	NS	NS

	Digestive	Neurological	Skin	Respiratory
Family income	S↑ <KD1000 0 S↓ KD1000-1500	NS	NS	NS
Mother problem during pregnancy	S↑	NS	S↑	S↑
Mother anaemia	NS	NS	NS	NS
Mother used treatment drugs	S↑	NS	NS	NS
Mother took paracetamol	S↑	NS	NS	NS
Mother took antibiotic	S↑	NS	NS	NS
Mother took epilepsy drug	NS	NS	S↑	S↑
Mother took diabetes drug	NS	S↑	S↑	NS
Mother took blood pressure drug	NS	NS	NS	NS
Mother took laxative	NS	NS	NS	NS
Mother took other drug	NS	NS	NS	NS
Previous abortion	NS	S↑	NS	NS
Mother obese	NS	NS	S↑	NS
Mother ate fish	NS	NS	NS	NS
Mother ate other seafood	NS	NS	NS	NS
Mother ate sweets	NS	NS	NS	NS
Mother ate chocolate	NS	NS	NS	NS
Mother ate fried foods	NS	NS	NS	NS
Mother ate salty foods	NS	NS	NS	NS

	Digestive	Neurological	Skin	Respiratory
Mother ate diet foods	NS	NS	NS	NS
Mother ate meat	NS	NS	NS	NS
Mother ate fresh vegetables	NS	NS	NS	NS
Mother ate fresh fruit	NS	NS	NS	NS
Mother ate ready-made soup	NS	S↑	NS	S↑
Mother drank carbonated soft drink	NS	NS	NS	S↑
Mother drank tea or coffee	NS	NS	NS	NS
Mother drank herbal tea	NS	NS	S↓	NS

Note: NS no significant difference; S↑ significant increase at 0.05 level; S↓ significant decrease at 0.05 level.

Discussion:

The observation that male infants had significantly greater skin problems is not entirely unexpected, since it is well known that they are more prone to baby acne (erythema toxicum neonatorum) than are females (patient.co.uk, 2014). However, the finding that high birthweight infants suffered more skin problems was unexpected.

For many years, the conventional wisdom has been that the ideal time for motherhood, both for mother and infant, is somewhere in the mid-twenties. Younger and older mothers tend to differ in many aspects other than age (Qu et al, 2006). In this series, there does appear to be a 'magic' middle age, at least

as far as respiratory problems in the infant are concerned.

Unexpectedly, neurological problems were significantly less in infants of older fathers. This appears to be at odds with well-known hazards of births to older fathers (Raeburn, 2009).

Another unexpected result was a significantly lower incidence of neurological problems in infants of currently working mothers. This is apparently not due to differences in family income, though infants in families with the lowest incomes were more prone to digestive upset.

A high percentage (60%) of the women in the study reported suffering from one or more pregnancy-related problems, and infants born to these women were significantly more likely to suffer digestive, skin and respiratory problems. However, despite the fact that maternal anaemia is known to cause poor growth in offspring (Kalaivani, 2009), no correlation between maternal anaemia and problems in infants was found in this study.

At 29.4% of mothers, the usage of medications during pregnancy was very low compared with nearly universal usage in other surveys (Refuerzo et al., 2005). The major drug used (18.3%) was paracetamol. Frequent prenatal paracetamol use has been associated with wheezing in early childhood (Shaheen et al., 2002) and has also been implicated in autism (Bauer and Kriebel, 2013). However, in the current study, the only association noted was with a greater incidence of digestive problems. Antibiotics, the second-most used class of drugs, were also associated with a greater

incidence of digestive problems. Though not previously recorded, it is feasible that both paracetamol and antibiotics could exert a lasting effect on the developing intestine.

Management of epilepsy during pregnancy is a delicate balance between controlling seizures with the smallest possible amount of potentially teratogenic drugs (Battino and Tomson, 2007). In the present study, infants of mothers taking antiepileptic drugs had a significantly higher incidence of skin problems but a lower incidence of respiratory problems. Such an effect has not been reported previously.

Pre-existing diabetes is associated with increased peri- and neonatal mortality and morbidity (Williams and Modder, 2010). It was therefore unexpected that infants of mothers taking antidiabetic drugs were significantly less likely to manifest neurological or skin problems. This implies that diabetes in these mothers was well controlled and that the drugs used to do so are exerting a direct beneficial effect on the foetus.

Some antihypertensives are known to be fetotoxic (Magee, 2001). However, no significant difference was observed between infants born to mothers taking antihypertensives and those who did not.

According to Virk and colleagues (Virk et al., 2007) previous abortion does not appear to increase the risk of preterm birth or low birthweight. However, in the current study, infants born to mothers who had a previous abortion were significantly more likely to suffer from neurological problems.

Whereas McGuire and colleagues (McGuire et al., 2010) consider maternal obesity to be associated

with deleterious effects on the foetus and newborn, the only effect noted in this study was a diminished likelihood of skin problems.

In a survey of maternal fish and shellfish intake and pregnancy outcomes, Guldner and colleagues (Guldner et al., 2007) found fish consumption to be associated with increased gestation length and shellfish consumption with decreased foetal growth. Oken and colleagues (Oken et al., 2008) found that maternal fish intake >2 servings/week during pregnancy was associated with better child cognitive test performance, as long as care was taken to avoid mercury-contaminated fish, as higher mercury levels were associated with poorer test scores. Fish intake during pregnancy has also been found to protect against the risk of eczema at 1 year old (Romieu et al., 2007) and against atopy in children of non-allergic mothers (Calvani et al., 2006). Fish oil supplementation has been tested in several trials, with small positive effects observed on length of gestation but no effect on cognitive development or infant growth (Makrides and Gibson, 2002). In the present study, there was no effect of maternal fish or shellfish consumption on symptoms in infants.

A study in Brazil reported an association between coffee consumption and intrauterine growth retardation (Rondó et al., 1996), while Xue and colleagues (Xue et al., 2008) found that daily consumption of each additional cup of coffee was associated with a ~10 g decrease in birthweight. On the other hand, infants of the 88.4% of mothers who drank tea or coffee during pregnancy in the present study did not show any increase in symptom rates. However, lower birthweight

was also not associated with an increase in symptom incidence.

Recently, Triche and Lundsberg (2013) reported a modest association of caffeine with lower birthweight, and it may be that caffeine does exert an effect; infants of mothers in this study who drank carbonated soft drinks, many of which were caffeinated (e.g., Coca-Cola), experienced significantly more respiratory symptoms. It could be that the antioxidants in coffee and tea mitigate the effects of caffeine to some extent.

The increase in skin problems observed in infants born to mothers who ate nuts during pregnancy could be a reflection of an allergic response, or it could be related to the fact that many of the nuts consumed contain monosodium glutamate, hydrogenated oils, butylated hydroxyl anisole or butylated hydroxyl toluene.

The deleterious effects of ready-made soups could also be due to additives because all ready-made soups marketed in Kuwait contain monosodium glutamate, and some also contain hydrogenated oils.

On the other hand, the beneficial effects noted for herbal drinks could be due to the fact that they contain antioxidants, bioflavonoids, vitamins and minerals.

Limitations

The study suffers from a number of limitations, including:

- possible bias in the selection process;
- possible faulty recall by participants;
- subjectivity for some of the symptoms and their grouping;

a lack of information on breastfeeding, meaning that the study was unable to examine the contribution of maternal food/drug intake beyond the prenatal period.

Conclusion:

Despite these limitations, the study provides direction for further studies in parental (especially maternal) prenatal influences on infant health, and provides information for health and nutrition experts to educate parents.

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