Pattern of growth and development of premature children at the age of two and three years in Alexandria, Egypt (Part II)

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نمط النمو والتطور لدى الاطفال الخدّج (المبتسرين) في سن الثانية والثالثة بالإسكندرية ، جمهورية مصر العربية (الجزء الثاني)

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هذا هو الجزء الثاني من بحث أجري بالإسكندرية على ٦٨ طفلاً خديجاً (مبتسراً) ، وكانت المجموعة الشاهدة مكونة من ضعفَيْ هذا العدد من الأطفال المولودين لتمام الحمل ، والمماثلين لمجموعة الخدّج في العمر والنوع . لقد تم في الجزء الأول من البحث عرض اختلافات النمو والتطور فيما يتعلق بالخداج (الابتسار) أما هذا الجزء فيتناول عوامل الخطر المتعلقة بالابتسار . ولقد كشفت الدراسة أن تدني المستوى التعليمي للآباء ، وممارسة الوالدين لعادة التدخين من عوامل الخطر المهمة في حالات الخداج . كما تبين أن متوسط عمر الوالدين وإنجابية الأم كانا أعلى كثيراً في حالة الأطفال الخدّج (المبتسرين) . وكشفت الدراسة عن عوامل خطر أخرى لاسيما أن الأمهات المصابات بالداء السكّري أو الالتهاب الكلوي المزمن كنّ أكثر تعرضاً لولادة طفل خديج (مبتسر) .

This is the second part of a paper on a study conducted in Alexandria on 68 premature children. Controls were full-term children, double the number of prematures, and matched by age and sex. The first part presented differences in growth and development in relation to prematurity. This part deals with risk factors for prematurity. The study revealed that low educational level of fathers and parental smoking were significant risk factors for prematurity. The mean age of both parents and mothers' gravidity were significantly higher for prematures. Other risk factors were identified. Mothers with diabetes and chronic nephritis were more likely to have a premature child.

Croissance et développement des enfants prématurés âgés de deux et trois ans à Alexandrie (Egypte) (Deuxième partie)

Voici la deuxième partie d'une étude réalisée à Alexandrie auprès de 68 enfants prématurés. Les sujets témoins étaient des enfants nés à terme, en nombre double de celui des prématurés avec une répartition par âge et par sexe similaire à celle des prématurés. Dans la première partie, on présentait les différences de croissance et de développement liées à la prématurité. Dans cette seconde partie, on s'occupe des facteurs de risque de la prématurité. L'étude a révélé que le faible niveau d'éducation du père et le tabagisme des parents constituent des facteurs de risque importants pour la prématurité. L'âge moyen des deux parents et celui de la mère au moment de la grossesse étaient considérablement plus élevés dans le cas des prématurés. D'autres facteurs de risque ont été identifiés. Les mères diabétiques et celles qui souffrent de néphrite chronique courent un plus grand risque d'avoir un enfant prématuré.

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Introduction

Prematurity is defined as a gestational age of less than 37 weeks calculated from the first day of the last menstrual period (less than 259 days) [*1–4*]. Premature births are associated with many problems of major clinical significance. Hence, it is necessary to find measures for reducing the incidence of prematurity. Successful prevention depends on knowledge of causation and identification of risk factors. This second part of the study was carried out to reveal the relation between some risk factors and the problem of prematurity.

Subjects and methods

An interview format was designed to collect information from mothers of selected children. It included enquiry about parental age, education, occupation and personal habits. Maternal age at marriage and conception of the index child, the antenatal and natal care and the mother's obstetric history were also investigated (see Part I).

Results

The data were fed to the computer using the *Epi Info/PC+* program. The mean, the standard deviation, the odds ratio (OR) and 95% confidence interval (CI) were computed according to relevant literature and expert opinion [*5*]. The following statistical tests were used: chi-square, z test and t test, and the 5% level was taken to test the significance of the results obtained.

Social factors (Table 1)

Children whose fathers had only had primary education had more than three times the risk of being premature than those born to fathers with secondary or university education (odds ratio = 3.31). On the other hand, maternal education was a statistically insignificant risk factor for prematurity.

Regarding occupation, fathers of prematures were more likely to be semi-skilled workers: 25.0% compared to 14.0% of fathers of controls (odds ratio = 1.64).

A significantly higher percentage (58.8%) of prematures' fathers were smokers compared to 30.9% of controls. Smokers were more than three times at risk of having premature children compared to nonsmokers (OR = 3.20). A minority of prematures' mothers (5.9%) were smokers compared to none of the mothers who gave birth to full-term infants.

Biological factors (Table 2)

The mean age of prematures' fathers was significantly higher than that of the controls (38.25 ± 8.21 years and 36.03 ± 7.04 years, respectively; $t = 2.01$). The same was true of the mean age at conception of prematures' mothers and their controls (30.07 ± 7.35 and 26.70 ± 5.73 years respectively; $t = 3.6$). A significant risk of prematurity was also associated with birth order rank fifth or higher ($\chi^2_3 = 20.29$)

Prematures' mothers had a significantly higher mean number of pregnancies (4.22 ± 1.82 pregnancies; $t = 4.58$). On the other hand, an insignificant statistical difference was noticed regarding interbirth intervals; $t = 0.09$.

Obstetric and medical factors (Tables 3 and 4)

An increased risk of prematurity was noticed among mothers who had a history of previous abortion (OR = 4.89) and a history of previous twin pregnancy (OR = 8.23). Moreover, mothers who had a history of premature delivery were nearly 32 times at risk of prematurity. On the other hand, pre-

Table 1 **Distribution of premature children and controls according to social background**

Social factor	Premature children		Controls		Odds ratio (OR)	Confidence interval (CI)	Chi-square (χ^2)
	No.	%	No.	%			
Father's level of education							
Illiterate	21	30.9	43	31.6	1.71	0.75–3.93	1.90
Primary	17	25.0	18	13.2	3.31	1.28–8.62	7.59*
Preparatory	14	20.6	19	14.0	2.58	0.97–6.88	4.47*
Secondary or university	16	23.5	56	41.2	1		
TOTAL	68	100	136	100			
Mother's level of education							
Illiterate	39	57.4	63	46.3	1.90	0.89–4.10	3.19
Primary	9	13.2	16	11.8	1.73	0.56–5.27	1.13
Preparatory	5	7.4	11	8.1	1.39	0.32–5.26	0.29
Secondary or university	15	22.1	46	33.8	1		
TOTAL	68	100	136	100			
Father's occupation							
Professional	6	8.8	11	8.1	1		
Skilled	32	47.1	69	50.7	0.85	0.26–2.86	0.09
Semi-skilled	17	25.0	19	14.0	1.64	0.43–6.39	0.66
Manual	12	17.6	24	17.6	0.92	0.23–3.65	0.02
Commercial	1	1.5	13	9.6	0.14	0.01–1.57	3.37
TOTAL	68	100	136	100			
Smoking habit of father							
Nonsmokers	28	41.2	94	69.1	3.20**	1.67–6.13	14.63
Smokers	40	58.8	42	30.8			
≤ 1 packet/day	*11*	*27.5*	*23*	*54.7*			
> 1 packet/day	*29*	*72.5*	*19*	*45.2*			
TOTAL	68	100	136	100			

** Statistically significant*

***OR calculated comparing smokers versus nonsmokers for prematures and controls without regard to the amount smoked*

vious history of stillbirth was statistically insignificant.

Regarding obstetric and medical risk factors during the index pregnancy, mothers who had obstetric risks (including multiple pregnancies, pre-eclampsia and fibromyomas) were 35 times more at risk of prematurity than mothers of control. Mothers who had diabetes and/or chronic nephritis during the index pregnancy were nearly eight times more likely to have a premature child than mothers free from either disease.

Less than one third (29.4%) of the prematures' mothers had either forceps delivery or caesarean section compared to 8.1% of controls' mothers. This difference was

Table 2 **Distribution of premature children and controls according to biological factors**

Biological factor		Premature (*n* = 68)	Controls (*n* = 136)	*t* value
Fathers' age at the time of interview (years)	*r*	24–58	22–63	2.01*
	$\bar{x}$	38.25	36.03	
	σ	8.21	7.04	
Mother's age at marriage (years)	*r*	16–31	16–33	0.20
	$\bar{x}$	21.84	21.72	
	σ	3.92	3.84	
Mother's age at conception (years)	*r*	17–46	17–42	3.60
	$\bar{x}$	30.07	26.70	
	σ	7.35	5.73	
Mother's gravidity	*r*	1–13	1–9	4.58*
	$\bar{x}$	4.22	2.60	
	σ	3.26	1.82	
Interbirth interval excluding 1st pregnancy (months)	*r*	1.5–96	2–96	0.09
	$\bar{x}$	30.45	30.77	
	σ	23.79	16.99	

Birth order	Premature children No.	%	Controls No.	%	Odds ratio (OR)	Confidence interval (CI)	Chi-square (χ^2)
1st	17	25.0	43	31.62	1.31	0.57–3.00	0.48
2nd and 3rd	19	27.9	63	46.32	1		
4th	5	7.4	13	9.56	1.28	0.34–4.54	0.17
5th and more	27	39.7	17	12.50	5.27	2.22–12.66	17.88*
Total	68	100	136	100			

** statistically significant*
$p \leq 0.05$; r = range; $\bar{x}$ = mean; σ = standard deviation

statistically significant, $\chi^2 = 16.9$. Moreover, the majority of prematures (82.4%) were delivered at hospital, compared to 52.9% of full-term infants; and 38.2% of prematures deliveries were attended by obstetricians, compared to 14.0% of controls. These differences are statistically significant ($\chi^2_2 = 20.78$).

Table 4 shows that nearly equal proportions of both prematures' mothers (85.3% and their controls (84.5%) received antenatal care during index pregnancy ($z = 0.15$). The places of care included maternal and child health centres, polyclinics, private clinics as well as health insurance clinics. A higher percentage of prematures' mothers (43.1%) were examined at a private clinic compared to 34.8%. But this difference was statistically insignificant.

A slightly higher percentage of prematures' mothers (53.5%) than mothers of controls (48.8%) had weight assessment at prenatal clinics ($z = 0.64$). However, a significantly higher percentage of prematures' mothers had their blood pressure measured (67.2% and 48.8%; $z = 2.49$).

Table 3 **Distribution of prematures' mothers and their controls according to obstetric and medical problems associated with the index pregnancy**

Obstetric and medical problems		Premature children No.	%	Controls No.	%	Odds ratio (OR)	Confidence interval (CI)	Chi-square (χ^2)
Obstetric problems	Yes	39	57.4	5	3.7	35.23	11.90–112.11	76.83*
	No	29	42.6	131	96.3	77.21*		
Medical problems	Yes	10	14.7	3	2.2	7.64	1.85–36.50	[$p < 0.0012$ using Fisher's test]
	No	58	85.3	133	97.8	11.87*		
Drug intake (for treatment of medical conditions)	Yes	45	66.2	56	41.2	2.80	1.46–5.38	11.28*
	No	23	33.8	80	58.8	11.33*		

** statistically significant*

Table 4 **Distribution of premature children and their controls according to type and place of delivery and birth attendant**

Variable	Premature children No.	%	Controls No.	%	Chi-square (χ^2)
Type of delivery					
Normal	48	70.6	125	91.9	16.00*
Abnormal	20	29.4	11	8.1	
Place of delivery					
Home	10	14.7	50	36.8	16.88*
Hospital	56	82.4	72	52.9	
Private/polyclinic	2	2.9	14	10.3	
Birth attendant					
Obstetrician	26	38.2	19	14.0	
General practitioner	33	48.5	67	49.3	20.78*
Midwife or other	9	13.2	50	36.8	
TOTAL	68	100	136	100	

** $p \leq 0.5$*

Discussion

The present study has investigated selected risk factors that were considered as contributors to the problem of prematurity.

Most investigators point to the increased risk of preterm deliveries among women of low socioeconomic status [*6–9*]. Among the various determinants of socioeconomic status investigated in the present study, only

low educational attainment by the father was associated with a significantly higher risk of prematurity. This could be attributed to lack of awareness among such husbands, which is reflected in maternal fertility pattern, interpregnancy interval, use of antenatal services, maternal nutrition and smoking that exert a direct biological effect on the growing fetus [*10,11*].

Several studies have revealed that maternal smoking is associated with a reduction in gestational age, preterms and low birth weight deliveries [*12–15*]. In the present study, 5.3% of prematures' mothers were smokers compared to none of those who gave birth to a full-term baby. Moreover, the adverse effect of tobacco could also be the exposure of expectant mothers to passive smoking. In the present study, a significantly higher percentage of fathers of premature children were smokers ($z = 3.83$). In fact, smoking fathers were more than three times at risk of having a premature child than nonsmokers (OR= 3.20; CI = 1.67–6.13).

Berkowitz et al. have stated that women above 35 years of age are more likely to have a premature delivery [*11*]. In the present study, mothers of premature children reported a significantly higher gravidity ($t = 4.58$). It is possible that the higher age and higher gravidity of prematures' mothers contributed to the premature delivery of the index child. Mothers of three or more parities are at increased risk of adverse pregnancy outcome including low birth weight and prematurity [*16–18*].

Some studies have found a significant relation between higher birth order and prematurity [*6,7,19*]. This was also revealed by the present study ($\chi^2_3 = 20.29$) where the risk of prematurity among children ranked fifth onwards was more than five times greater compared to those whose birth order ranking second or third (OR = 5.27; CI = 2.22–12.66).

The present work investigated previous obstetric history among mothers in both index and control groups, including previous abortions, stillbirths, premature deliveries, as well as twin pregnancies. It revealed a preponderance of previous history of abortions among mothers who delivered prematurely than those who had a full-term delivery ($\chi^2 = 24.10$). Similar findings have been revealed by Main, as well as others [*10,12,16,20*].

Berkowitz pointed to the significant risk of prematurity in association with induced abortion, which was attributed by Obel and Slater to the effect of cervical dilatation and curettage [*7,21,22*].

The present study revealed that previous history of stillbirth cannot be viewed as a risk factor for subsequent premature deliveries ($\chi^2_1 = 0.21$). This was revealed by Meirik et al. [*23*]. Several studies have found that previous history of low birth weight or preterm delivery is one of the most important risk factors for a subsequent preterm birth [*6,7,9*]. In the present study, previous preterm delivery was found to be associated with a recurrence risk (OR = 31.91; CI = 4.19–669.04).

The present work revealed that previous history of twin pregnancies is associated with nearly eight times greater recurrence of preterm delivery (OR = 8.23; CI = 3.06–22.96). Hence a woman who has had a twin pregnancy is liable to have a subsequent pregnancy which will also end in a preterm delivery [*4,24,25,26*].

The present work revealed that mothers who reported medical problems during the index pregnancy were found to suffer either from diabetes mellitus or chronic nephritis. These mothers were about eight times at risk of having a premature child (OR = 7.64; CI = 1.85–36.50). Both condi-

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