

Original article

The potential risk factors for childhood disabilities in Riyadh rural areas, Saudi Arabia

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Background: Childhood disability is a public health concern due to their impacts on quality of life and productivity not only for affected children but also for families and populations as a whole. There are at least 650 million people with disabilities worldwide.

Objective: To identify the major biological predictors of disabilities in children, the potential pre-natal, natal, and post-natal risk factors for the disabled children in Riyadh rural areas.

Materials and Methods: A survey of 450 Saudi children, pre-school and school age children, below 20 years was carried out between October 2010 and March 2011 with approval by the Institutional Review Board. The study was conducted from children day care center at Riyadh rural area. Data were collected from the case files by clinical staff.

Results: Children with motor disabilities represented the highest percentage, followed by those having speech, mental, and educational disabilities. The least number of disabilities was the children with auditory deficits. The results of the current study have emphasized certain pre-natal risk factors including extreme ages of marriage, high parity, illiteracy, and consanguineous marriages. Consanguinity, multiparity, and mother childbirth age could be considered as a risk factor for mental (risk ratios (RR) 2.06, 95% CI 1.526-2.7), (RR 1.8, 95% CI 1.2-2.6), (RR 4.7, 95% CI 2.6-8.47) and auditory disabilities (RR 2.6, 95% CI 1.7-3.76), (RR 2, 95% CI 1.25-3.19), (RR 2.6, 95% CI 1.29-5.2). According to our study caesarian labor and prematurity could be considered as a risk factor for motor disability (RR 2.3, 95% CI 1.7-3.1), (RR 2.6, 95% CI 1.46-4.6) while multiparity, very low birth weight, and prematurity were associated with increased risk for speech disabilities (RR 1.14, 95% CI 0.76-1.7), (RR 1.46, 95% CI 0.76-2.76), (RR 7.3, 95% CI 4.9-10.3). In addition, caesarian labor was associated with increased risk for auditory disabilities (RR 1.13, 95% CI 0.59-3.49), while multiparity and mother childbirth age were associated with increased risk for visual disabilities (RR 5.6, 95% CI 4.1-8.27), (RR 7.2, 95% CI 4.19-12.3).

Conclusion: Increasing the knowledge about disabilities' risk factor could reduce the incidence of future disability.

Keywords: Childhood disabilities, natal and post, natal risk factors, pre-natal, Riyadh rural areas

National survey in Saudi Arabia reported the prevalence of major disabilities among children to be (6.33%). Studies of prevalence of disabled children in Riyadh are still insufficient. Previous studies had shown that motor disability is the most common kind of handicap, however other kinds of disabilities including learning, mental, speech, hearing, visual,

behavioral and emotional disabilities have also been monitored [1-4].

Despite the global interest in child disability, in developing countries relatively little is known about the situation of children with disabilities, concerning the magnitude of the problem, prevention, rehabilitation, medical and social requirements to combat this problem [3-5]. Saudi Arabia has undergone rapid economic development in the last few decades with improvement of the health care and rehabilitation services [1, 5]. However, rural areas are still suffering a deficiency in those services.

The risk factors may be singular or multiple. Several studies have documented the role of

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intrauterine environment, hazards of prematurity birth process, postnatal factors, early and late marriages and childbearing, illiteracy, unemployment, high parity, and consanguineous marriages [1, 2]. Consanguinity (family intermarriages) is commonly practiced in many Asian, African, and Latin America communities. In Saudi Arabia, certain consanguineous marriage as first cousins mating is encouraged as part of the social customs, especially among tribes. The siblings of consanguineous marriage have significantly high incidence of hereditary diseases including hearing impairment [2].

The aim of the study was to identify the major biological predictors of disabilities in children, the potential pre-natal, natal and post-natal risk factors for the disabled children in Riyadh rural areas. This study could provide estimates of childhood disability prevalence that are likely to be valuable for some purposes aiming at prevention of future disabilities and decreasing the burden of disabilities on Saudi population.

Material and methods

A survey of 450 Saudi children, pre-school and school age children, below 20 years was carried out between October 2010 and March 2011 with approval by the Institutional Review Board. The study was conducted from children day care center at Riyadh rural areas. Data were collected from the case files. The information from the case files is authentic as data were collected by clinical staff with at least a graduate degree in the field of disability and minimum of four years experience thereafter. The files recorded medical, psychosocial, and educational information from parents, interviews and from other relevant records. The Data collected consisted of information regarding age, illiteracy, consanguinity of parents, types of disabilities, family history of disabilities, and exposure to various known risk factors for disabilities. Maternal illiteracy meant that the mother had never attended school and consanguineous marriage was regarded as first cousins marriage.

All data from the survey, the screening, were recorded on pre-coded forms, entered into a computerized database, and linked by study identification numbers (with all personal identifiers removed). Accuracy checks and necessary corrections were made both before and after the data were entered into the database.

Ninety-five percent confidence intervals were calculated for each risk ratio (RR). These intervals indicate the lower and upper limit of the RR, which contains the true parameter 95% of the time over unlimited repetitions of the study, assuming there was no bias. Thus, RRs, for which either confidence limit was equal to or less than 1.0, were not considered as a risk because they did not reach the conventional 5% level of significance [6].

Results

Our study clearly demonstrated a high percentage of consanguinity among the Saudi population and a definite role of consanguinity in the etiology of different childhood disability. Four hundred fifty children were included in the current study. Their ages ranged from 2 to 20 years (**Table 1**). Of the total number, 143 (31.8%) were boys and 307 (68.2%) were girls. All of them were from rural areas in Riyadh, Saudi Arabia.

The results representing the types of disabilities are shown in (**Table 2**). Most of the children were found to have mixed type of disabilities with a percentage of 43.1%. Children with motor disabilities represented the highest percentage of single disability (33.6%), followed by those having speech (27.3%), mental (20.4%) and educational (20%) disabilities. The least number of disabilities was that of the children with auditory deficits (9.8%).

Table 1. Sociodemographic data of the disabled children in Riyadh, rural regions

Age	Number of cases (%)
2-5 years	115 (25.5)
6-10 years	151 (33.6)
11-15 years	117 (26)
16-20 years	67 (14.9)
Total examined children	450 (100)

Table 2. Types of disabilities among the selected children in Riyadh, rural regions

Types of disabilities	Number of cases (%)
Motor disabilities	151 (33.6)
Mental disabilities	92 (20.4)
Visual disabilities	62 (13.8)
Speech disabilities	123 (27.3)
Auditory disabilities	44 (9.8)
Educational disabilities	90 (20)
Multiple disabilities	194 (43.1)
Total examined children	450 (100)

The percentage of mothers who never attended school was as high as 84%, which was not pointed out as a risk factor as it might be considered as an indirect risk factor as illiterate women are known to start having kids at an early age. It is also common for rural area population to have more than six children. As shown in (Table 3) consanguineous marriages were reported as the most common prenatal risk factor (35.3%), followed by multiparity (more than 4 children), which accounted for (18.4%) of the cases. Abortion and mother childbirth age (more than 40 or less than 17 years) accounted for 9.6% and 9.3% respectively. Other pre-natal conditions that affected the mother during pregnancy, such as German measles

and stillbirth were reported equally as 3.3%, while pre-eclampsia and diabetes were 7.1% and 7.3% respectively. The least number of disabilities was that of the children with disabled mothers (2.4%).

Natal and post-natal risk factors among disabled children in rural areas of Riyadh region were demonstrated in Table 4. As risk factors during or after deliveries, caesarian section deliveries were noticed to be as high as 21.8% while 16.4% of the children were offered oxygen after delivery. Among the disabled children, 14% of cases had been admitted to the neonatal intensive care units, 12.7% suffered from obstructed labor and 12.2% were severely premature (less than 28 weeks gestation).

Table 3. Pre-natal risk factors among disabled children in Riyadh, rural regions

Maternal risk factors	Number of cases (%)
Consanguinity	159 (35.3)
Abortion	43 (9.6)
Multiparity [#]	83 (18.4)
Previous disabled children	51 (11.3)
Mother childbirth age ^{##}	42 (9.3)
Stillbirths	15 (3.3)
Infant deaths	34 (7.6)
Pre-eclampsia	32 (7.1)
German measles	15 (3.3)
Diabetes mellitus	33 (7.3)
Disabled mothers	11 (2.4)
Total examined children	450 (100)

[#]more than 4 children, ^{##}more than 40 or less than 17 years.

Table 4. Natal and postnatal risk factors among disabled children in Riyadh, rural regions

Maternal risk factors	Number of cases	% of cases
Caesarian/assisted labor	98	21.8
Obstructed labor	57	12.7
Prematurity [#]	55	12.2
Very low birth weight ^{##}	42	9.3
Overweight	24	5.3
Oxygen therapy	74	16.4
Jaundice	34	7.8
Congenital anomalies	15	3.3
Admission to Neonatal Intensive Care Unit	63	14
Mixed risk factors	50	11.1
Total examined children	450	

[#]less than 28 weeks of gestation, ^{##}less than 1500 gm at birth

The statistical analysis presented in **Table 5**, revealed that consanguinity, multiparity, and mother childbirth age could be considered as risk factors for mental (risk ratios (RR) 2.06, 95% CI 1.526-2.7), (RR 1.8, 95% CI 1.2-2.6), (RR 4.7, 95% CI 2.6-8.47) and auditory disabilities (RR 2.6, 95% CI 1.7-3.76), (RR 2, 95% CI 1.25-3.19), (RR 2.6, 95% CI 1.29-5.2). Stillbirth was associated with increased risk for mental disabilities (RR 2.7, 95% CI 0.9-7.87). According to our study, caesarian/assisted labor and prematurity could be considered as risk factors for motor disability

(RR 2.3, 95% CI 1.7-3.1), (RR 2.6, 95% CI 1.46-4.6), while multiparity, very low birth weight, and prematurity were associated with increased risk for speech disabilities (RR 1.14, 95% CI 0.76-1.7), (RR 1.46, 95% CI 0.76-2.76), (RR 7.3, 95% CI 4.9-10.3). In addition, caesarian/assisted labor was associated with increased risk for auditory disabilities (RR 1.13, 95% CI 0.59-3.49), while multiparity and mother childbirth age were associated with increased risk for visual disabilities (RR 5.6, 95% CI 4.1-8.27), (RR 7.2, 95% CI 4.19-12.3).

Table 5. Risk ratios associated with prenatal, natal, and postnatal maternal risk factors on rates of some disabilities in the selected disabled children in Riyadh rural regions

Maternal risk factors	Disabilities	RR	CI (95%)
Consanguinity	Motor	0.4	(0.3-0.456)
	Mental	2.06	(1.526-2.7)
	Visual	0.3	(0.164-0.54)
	Speech	0.39	(0.23-0.636)
	Auditory	12.6	(1.7-3.76)
Multiparity	Motor	0.6	(0.36-0.9)
	Mental	1.8	(1.2-2.6)
	Visual	5.6	(4.1-8.27)
	Speech	1.14	(0.76-1.7)
	Auditory	2	(1.25-3.19)
Mother childbirth age	Motor	0.125	(0.06-0.246)
	Mental	4.7	(2.6-8.47)
	Visual	7.2	(4.19-12.3)
	Speech	0.5	(0.20-1.2)
	Auditory	2.6	(1.29-5.2)
Stillbirths	Motor	0	-
	Mental	2.7	(0.9-7.87)
	Visual	0	-
	Speech	0.2	(0.027-1.4)
	Auditory	0	-
Caesarian/assisted labor	Motor	2.3	(1.7-3.1)
	Mental	0.2	(0.07-0.532)
	Visual	0.4	(0.165-0.96)
	Speech	0.16	(0.04-0.58)
	Auditory	1.13	(0.59-3.49)
Very low birth weight	Motor	0	-
	Mental	0.25	(0.06-1.01)
	Visual	1	0
	Speech	1.46	(0.76-2.76)
	Auditory	0.75	(0.252-2.2)
Prematurity	Motor	2.6	(1.46-4.6)
	Mental	0.29	(0.16-0.84)
	Visual	0.545	(0.1-1.45)
	Speech	7.3	(4.9-10.3)
	Auditory	0.66	(0.24-1.7)

RR = risk ratio, CI = confidence interval

Consanguinity is a risk factor for mental and auditory disabilities, while multiparity is a risk factor for mental, visual, speech, and auditory disabilities. Mother childbirth age is a risk factor for mental, visual, and auditory disabilities. Stillbirth is a risk for mental disabilities. Caesarian/assisted labor is a risk factor for motor and auditory disability, while very low birth weight and prematurity are risk factors for speech disabilities. In addition, prematurity is a risk factor for motor disabilities

Discussion

Developmental disabilities are lifelong conditions that result in substantial emotional, psychological, and financial costs to affected persons, their families, and society. It has been estimated that over three-quarters of the world's disabled children less than 15 years of age live in developing countries [7]. The burden of childhood disability as a public health problem and the services offered to this category of patients in developing countries remain relatively unrecognized [7-9]. Most of the children in the present study were found to have motor disabilities followed by those having speech and then mental disabilities. The least number of disabilities was that of the children with auditory deficits. The reduced number of mental disability (20.4%) could be due to the difficulties of documenting in less developed countries, the causes of mental retardation are compounded by the lack of diagnostic services and routinely collected health data.

This study has emphasized certain maternal risk factors that exist in Saudi society and influence child health. They include extreme maternal age (early and late) of childbearing, as well as low education, multiparity and consanguineous marriages. These related marriages were mainly among first cousins.

Our results have shown that 9.3% of mothers married beyond the mother childbirth age. Early childbearing is fraught with insecurities as the mother is biologically and psychologically immature to cope with pregnancies and deliveries [10-13]. Mother childbirth age was shown from our results to increase the risk of having a mental or auditory disabled child. Arab countries as a whole are known to have high rates of early maternal marriage, a practice related to traditions and beliefs [11-13].

In our study, consanguinity was mainly identified as a risk factor for mental and auditory. There have been reports of severe mental retardation in Jordan, and cerebral palsy in Saudi Arabia, being associated

with consanguinity. In both cases, high rates of similar disease in siblings were noted [13].

We observed an overall prevalence of hearing impairment in Saudi children to be 9.8%, which is comparatively higher than reported in earlier studies from Saudi Arabia [14]. Our results also revealed that the families of children with hearing disabilities had a markedly elevated rate of consanguineous endogamy, which is consistent with the previous finding of Feinmesser, Tell, and Levi produced in a series of studies of Arab and Jewish children living [15].

The high ratio of consanguineous marriage has been attributed to traditions, maintenance of family structure and property. Previous studies revealed that consanguineous marriage is mostly associated with low socioeconomic status, illiteracy, and rural residence [16]. Different types of genetic disorders that have been reported to be common among children born of consanguineous marriage are congenital hearing loss, mental retardation, congenital heart defects, visual defects etc [17].

Mental retardation has long been attributed to interplay of several biomedical, socio-cultural, and psychological factors. Many studies find it difficult to incriminate only a single factor as the cause of mental retardation. Majority of the cases of mental retardation in previous studies was considered idiopathic [17]. While multiparity and stillbirth were also identified in our study as potential risk factors for mental retardation, previous studies identified multiparity as having the largest impact on the incidence of intellectual disability [18].

The consequences of poor motor development have been well documented [19, 20]. A higher incidence of birth-related factors such as prolonged labor, abnormal delivery, caesarean section, or use of forceps [21, 22] or child related factors such as toxemia, jaundice, intrauterine growth restriction (IUGR), preterm or overdue birth dates, or need for ventilation [23-25] have been noted among Myotonic Muscular Dystrophy (MMD) children. We found that children with motor delay were associated with caesarian/assisted labor and prematurity. Lindahl et al 1988 found that a small for gestational age (SGA), low birth weight (LBW), and signs of cerebral depression all increased the risk of poor motor performance by about 2-3 fold [26]. Monitoring of the functional outcomes, especially the motor domain for children with a history of prematurity and LBW

is highly recommended. According to our study, caesarian/assisted labor and prematurity could be considered as a risk factor for motor disability.

According to our study, very low birth weight (<1500 gram), Prematurity and multiparity were the most salient factors for speech impairment in children. This finding is consistent with previous research [27, 28].

Hearing impairment, which was defined in our study as need of amplification for both ears, was associated with caesarian/assisted labor. This problem has been attributed to CSF leakage, causing a reduction in perilymph pressure in the cochlea [29]. Cutting type needles of larger gauges (22G) are associated with a higher incidence of this complication than when finer gauge Quincke needles (25G) or pencil point needles are used [30].

This study showed that multiparity and mother childbirth age were associated with increased risk for visual disabilities. Previous studies have identified older-age (e"30 years) at childbearing, low education level and multiparous mothers as a significantly higher risk of having a visually disabled child [31].

In general perinatal and neonatal care deficiency boosts the occurrence of complications and therefore, the rate of child disability.

Conclusion

Some of the risk factors associated with disabilities are preventable as consanguinity through improving the knowledge of the society about the consequences of relative marriage and how it could affect the next generation. Young age of marriage is also considered as a risk factor that could be preventable with knowledge improvement about the burden on the mother and the high possibility of next generation disabilities. In fact, age of marriage has been raised in the last decade. This means possible improvement of the next generations' public health. Revolutionary improvement of public health service and maternal health checks in Saudi Arabia in the last few years could significantly decrease the exposure to some of the risks including pre-eclampsia, infant death and caesarean problems.

In general, more effort is required to reduce the incidence of future disability. This could be achieved through reducing the potential risk factors in the community through improving the quality of prenatal care, newly married people's knowledge, and rehabilitation services in order to raise the quality of life for those infants who survive.

Confirmation of the association between consanguinity and disability found in this study would suggest that public health campaigns might be indicated to inform families at risk about genetically inherited disorders and the increased risk conferred by consanguineous unions.

This study indicates that, while cesarean section continues to be a procedure that saves the lives of mothers and infants, both the medical and lay communities must bear in mind that most births are normal and more births should progress without undue intervention.

Early childbearing can be postponed by delaying early marriage and delaying the timing of the first birth through the effective use of family planning methods. In young women subsequent pregnancies should be discouraged as repeated pregnancies (multiparity) also increases prenatal risks.

This matter suggests the need for more strong family planning program efforts specifically for newly married adolescent couples. Teenagers-both males and females need easy access to contraceptives and confidential family planning services.

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