

Epidemiological study of Congenital Hydrocephalus in Sohag Governorate

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Abstract

Introduction: Hydrocephalus is defined as the extra cerebral accumulation of water, the commonest neurological anomalies, one of leading causes of morbidity and mortality in infants worldwide.

Objective: To study the epidemiology, evaluate management and prevention of Congenital Hydrocephalus.

Methods: A cross sectional study was conducted for infants from Sohag University and Insurance hospitals from March 2014 to December 2014. All recruited infants after clinical evaluation and investigation to ensure the diagnosis, were interviewed assessing socio-demographic conditions, risk factors then data are statistically analysed.

Results: In our study including 240 hydrocephalic infants and 600 non hydrocephalic, the estimated incidence of hydrocephalus was 6.76/1000 living births. Significant risk factors were identified: uniparity (53.3%), age of the mother <20 years at conception (25%), maternal diabetes (13.8%), fever and common cold (32.1%), exposure to pollutants, irradiation (15.1%) and (13.3%) respectively. Consanguinity was present in 58% , family history was detected in 20.8%, drugs intake in 63.8%, fathers above 50 years at time of conception was detected in 30.4%, of them (85.28%) were non professionals, no antenatal care (51.7%), polyhydramnios (7.5%), oligohydramnios (7.1%), early vaginal bleeding (14.2%), preeclampsia (7.5%), twins was recorded (7.9%), breech presentation in (12.9%). Congenital hydrocephalus was treated by shunt operation in 230 infants (85%), and prognosis was good in 70%.

Conclusions: Important risk factors have been identified, strongly associated with the development of congenital hydrocephalus in infants. Improvement antenatal care, socio-demographic conditions and adopted fortification of the staple food are needed to our locality.

Key words: Epidemiology, congenital hydrocephalus, management.

Introduction

Congenital hydrocephalus (from Greek hydro-, meaning "water", and ceph, meaning "head") is a medical condition usually congenital condition and which an abnormal accumulation of cerebrospinal fluid in the cerebral venticle(1).Morbidity and mortality rates vary internationally but in General and rising throughout the world, the highest incidence rates are found in Africa, Asia. Prevalence was reported (0.5-2) per 1000 pregnancies

world wide, with variations in prevalence ranging from (0.2-10) per 1000 in specific geographical locations. More than (300,000) cases are estimated to occur world wide each year, in Saudi Arabia, a birth prevalence of 1.6 per 1000 live births, in Egypt high prevalence 3.7-6.96/1000(2).

The increase did not continue in the following years, probably due to the improved prenatal and perinatal care of

these high-risk infants (3). Management was described in (1923) by use of endoscopic perforation of the floor of the third ventricle, endoscopic third ventriculostomy (ETV), but it was not a success because of technical problems and complications and for many decades ETV was not used(4).

Around (1960) the use of ventricular shunts became more common, as materials and techniques had improved, the use of modern shunts resulted in a reduction in mortality from 50% to about 10% during the last decade, ventriculostomy has once again been used more frequently as an alternative to shunt treatment, prevalence from 1979 to 1986 and this was thought to be due to the enhanced survival of infants born very preterm with a high risk of developing hydrocephalus with intraventricular haemorrhage as the cause(5)

Prevention was done by the Folic acid supplementation. The recommended daily dose of folic acid is 0.4 mg, surveys of hydrocephalus must be done in every country and even in different regions of same country to provide prevalence of hydrocephalus(6). The crude prevalence of infantile hydrocephalus was 0.57 per 1000 neonatal survivors, the gestational age prevalence was 21-65 per 1000 severe preterm infants, 1.99 per 1000 moderately preterm, and 0.36 per 1000 infants born at term(7). In Saudi Arabia, a prospective study from 1996-1997 reported a birth prevalence of 1.6 per 1000 live births, in children with hydrocephalus associated with abnormal folate intake or metabolism is known to have a role in the pathogenesis of hydrocephalus(8).

Aim of the work:

to study the epidemiology, evaluate post natal management and prevention of Congenital Hydrocephalus .

Subjects and Methods:

Type of the study:

A cross sectional study was conducted for infants in outpatient clinics and inpatients from Sohag University and health insurance hospitals as these hospitals received almost all cases from Sohag Governorate. The field work and data collection lasted from March 2014 to December 2014.

Sample size justification:

Number of hydrocephalic infants and control ones were calculated using computerized method (open Epi, version 3 open source calculator proportion)

N = the desired sample size when population is more than 10,000.

P = Prevalence of hydrocephalus (7.97 in developing countries per 1000).

So the calculated sample size was 240 infants with hydrocephalus and 600 control infants.

Target Patient:

The study population comprised of 240 infants with hydrocephalus from department of neurosurgery, Sohag faculty of medicine, Sohag University and crescent health insurance hospital as these hospitals received near all cases from Sohag governorate. For the purpose of comparison we aimed at recruiting hydrocephalic and non hydrocephalic infants attending the outpatient clinics and inpatients of these hospitals during the period from march 2014 to February 2015

Inclusion criteria for patients were:

Infants of congenital hydrocephalus.

Exclusion criteria for patients were:

Infants without hydrocephalus and hydrocephalic infants with complications

Tools of the study:

All recruited infants were interviewed, assessing history of socio-demographic conditions as maternal and paternal ages, father occupation, consanguinity,.

economic status, onset of prenatal care, geographic location of pregnancy. The questionnaire included history of co morbid conditions as maternal diabetes. Chronic hypertension, pregnancy induced hypertension, pre-eclampsia, eclampsia, single or multiparous gestation, maternal alcohol, tobacco, drug use, infection, trauma during gestation, trauma or sexually transmitted disease at parturition. Duration of hydrocephalus, type of treatment, patient compliance to treatment, regular check up with physicians, personal home care as home follow up of medical treatment, complications and other family members with hydrocephalus.

Investigations

Infants group with hydrocephalus underwent the following investigations: X ray, CT (computerized topography) and MRI (magnetic resonance imaging). Normal infants were examined to exclude hydrocephalus.

Data collection:

Data entry was done using Excel program then transferred to SPSS version 20 program, office 2013.

Statistical analysis:

The data was collected, coded and entered on Microsoft Excel Worksheet. Data was then transferred to SPSS format for data checking, cleaning and lastly analysis of data. The Program used for data analysis is SPSS version 20 for windows.

Descriptive statistics was done for demographic data. The statistical tests used in this study were student t test; Chi-Square test was used as a significant test. P value was considered significant when < 0.05 and regression analysis to calculate odds ratio was. A logistic regression was built to find the

risk factors that affect the epidemiology of hydrocephalus.

Ethical consideration

The study was approved by the Ethical committee of the Faculty of Medicine-Sohag University. An informed written consent was taken from all participants in the study. All participants were reassured of data confidentiality.

Results

The studied infants 240 live-born infants with surgically treated infantile hydrocephalus from February 2014 to December 2014 in Sohag University and Insurance hospitals.

Incidence of hydrocephalus calculated of all new cases of hydrocephalus 240 live-born infants with surgically treated infantile hydrocephalus divided by all live births registries in Sohag Governorate(35.500) live births, Incidence was 6.96/1000 live births.

In this study of 240 cases of infantile hydrocephalus, Maternal age mean/SD= 29 ± 9 years, infant age mean /SD= ± 31 days and period of gestation mean /SD= 8.5 ± 1 month. There was sex predominance as the female: male ratio was 2:1.

In our cross sectional study, several significant risk factors were identified among 240 well defined cases of congenital hydrocephalus. The percentages of risk factors in our study were as follow: uniparity 53.3%, age of the mother < 20 years at conception 25%, maternal illness especially diabetes 13.8%, fever and common cold 32.1%, exposure to pollutants, irradiation 15.1%-13.3% respectively.(63.8%) of mothers received some drugs (not exactly known) in first 3 months of pregnancy. Consanguineous marriage was present in 58% of parents of patients and family history of hydrocephalus was detected in 20.8% of affected families. Mothers

not received antenatal care (poor) 51.7%, polyhydramnios (7.5%), oligohydramnios (7.1%), early vaginal bleeding (14.2%), preeclampsia (7.5%), twin pregnancy was recorded in (7.9%), breech presentation in (12.9%) and delivery by CS was needed by (40%) of mothers of infants with hydrocephalus (table 1). Risk factors: low

Discussion

1-Incidence

Unusual high incidence (3.7-6.96/1000) was detected in Egypt and this agree with our results which was 6.96 per 1000 neonates. The incidence is high in some Arabian countries as Algeria 7.5/1000 also among Palestinians 5.49/1000. Also, Spanish have high incidence attributed to Arabian influences and consanguinity. Low incidence in the following countries respectively, Kuwait 1.19/1000, United Arab Emirates 1.14/1000, Bahrain 1.5/1000 and Oman 1.25/1000. Explanation of results recorded from The Gulf Cooperation Council (GCC) countries were mass educational dietetic program emphasized the importance of vegetables and fruit rich in folic acid (9).

2-Risk factors

The maternal risk factors for congenital malformations especially neurological ones, in a study of Ain Shams University, Egypt, were: maternal illness especially diabetes (7.28%), fever and common cold (16.69%), exposure to pollutants (58.57%). Mothers received antenatal care (31.8%), received multivitamins and folic acid during pregnancy were (27.5%). Mothers received some drugs (not exactly known) in first 3 months of pregnancy (36.32%). Mothers of infants with Hydrocephalus were more

significantly affected ($p < 0.05$) than controls with polyhydramnios (10.8%), oligohydramnios (9.81%) and preeclampsia (39.43%). Twin pregnancy was recorded in (2.94%) and breech presentation in (11.32%) in this study. Delivery by caesarean section (CS) was needed by (23.1%) of mothers of patients with Hydrocephalus. Consanguineous marriage was present in (45.8%) of parents of patients and family history of Hydrocephalus was detected in (16.69%) of affected families, these results agree with our results in Sohag Governorate (10).

3.Sociodemographic conditions

Young maternal age carried a higher risk of neural tube defects, as regards father occupation were significantly decreased (15%) in this study compared 40% in the normal group with significant difference. This denotes a higher incidence of hydrocephalus in lower sociodemographic groups (11). These are at higher risk due to environmental or life style factors. In addition their wives lack access to prenatal care, proper balanced nutrition and intake of vitamins or folic acid (12).

4-Antenatal care:

Poor antenatal care as mothers in this study did not receive antenatal care (51.7%). This high-lights the importance of measures for health promotion and disease prevention in child bearing-age women with special attention to prenatal care and childbirth which can influence neonatal indicators and prevention of birth defects (13). Multiparty was associated with increased incidence of hydrocephalus in this study (46.7%). The risk of mutations in women with 3rd and higher gravida is higher than in women with primary or secondary

gravida (12). The frequency of hydrocephalus presenting by breech in this study was (13%). It is well recognized that a foetus presenting by breech is more likely to have the congenital malformations approximately threefold (14). Good antenatal care in this study (48%) of mothers of patients with hydrocephalus had a positive history of drug intake (not definitely identified) in the first trimester of pregnancy. About 2–3% of all birth defects result from the use of drugs. The result is under weight, under developed and may be abnormal developed baby (15).

5-Environmental factors

Mothers in this study were cigarette smokers (76%) compared to (24%) of normal ($p < 0.05$), either actual smokers or passive smokers, i.e., exposed to environmental tobacco smoke. Maternal smoking for one month before conception through the third month of pregnancy (preconception period) was linked with birth defects of the brain, heart, cleft lip with or without cleft palate (CLP) (16). Women were exposed to pollutants by working or living near industrial factories, or helping their husbands in cultivating the land where pesticides were aggressively used (76%). In Egypt there is no specific regulations regarding the use of pesticides (type, amount) and there is no considerable awareness about possible related health problems including hydrocephalus (17).

6-Importance of vitamins and folic acid

Mothers received folic acid or multivitamin (76%) were which is significantly lower than that in the normal group. Vitamin B12 might also confer health benefits, however such benefits are difficult to ascertain because of the complementary

functions of vitamin B12 and folic acid, so foods have to be fortified with vitamin B12 in addition to the current mandatory folic acid fortification of grains (18).

Conclusions & Recommendations:

1-Health education as regards risk factors were: uniparity, young maternal age, exposure to irradiation, contact with infectious agents, smoking, drug intake, twins, maternal diabetes, consanguinity, low sociodemographic conditions congenital malformations than a foetus with cephalic presentations, the abnormality is approximately threefold (14). We found a higher frequency of Hydrocephalus in the offspring of mothers having pre-eclampsia (8%) compared to normal. The incidence of major congenital anomalies in infants of diabetic mothers was (11%) 5 times higher than and positive family history of hydrocephalus must be voided.

1-Folic acid supplementation. The recommended daily dose of folic acid for reduction of risk of hydrocephalus in women with no previous affected pregnancies is 0.4 mg.

2-Surveys of hydrocephalus must be done in every country and even in different regions of same country to provide prevalence of hydrocephalus, pattern of occurrence, nature, identify causes and associated risk factors and ultimately to prevent or reduce the occurrence of hydrocephalus that responsible for infant mortality rate under 5 years (23.8/1000) and neonatal mortality rate (15.3/1000) in Sohag Governorate.

3-Prenatal diagnosis and screening programs to prevent these severe, costly, often deadly defects must to be planned in our locality.

4- Further researches are recommended to confirm the actual risk factors which contribute to hydrocephalus in our locality pattern

(of occurrence, nature, identify causes and associated risk factors, prenatal diagnosis and screening programs to prevent these severe, costly, often deadly defects to conclude, hydrocephalus continues to be an important cause of morbidity and mortality in infants including Egypt.

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Table (1.1) Sociodemographic characteristics and risk factors of the studied hydrocephalic infants

Variable		Number of cases(No)	Percent (%)
Infant's characteristics			
Disease	Hydrocephalus	240	
	Normal	600	
Age (in days)	Mean	33.392	
	SD	31.237	
	Range	1-150	
Residence	Rural	200	80
	Urban	40	20
Maternal risk factors			
Maternal age (in years)	Mean	28.625	
	SD	8.735	
	Range	18-50	
Mother age <20 years	Yes	60	25
	No	180	75
Parity	Unipara	128	53.3
	Multipara	112	46.7
DM		33	13.8
Fever		77	32.1
Exposure to irradiation		32	13.3
Contact with infectious case		37	15.4
Smoking	Active	2	0.8
	Passive	180	75
	Non	58	24.2
Drug intake		153	63.8
Contact with pollutant		37	15.4
Family risk factors			
Consanguinity		138	57.5
Family history		50	20.8
Paternal risk factors			
Age of the father	<50 years	167	69.6
	>50 years	73	30.4
Period of gestation (in months)	Mean	8.563	
	SD	0.706	
	Range	7-9.5	

Table (1.2) Sociodemographic characteristics and risk factors of the studied hydrocephalic infants

Variable		Number of cases(No)	Percent (%)
Antenatal care	Good	116	48.3
	Poor	124	51.7
Previous abortion or stillbirth		64	26.7
Preeclampsia		18	7.5
Amniotic fluid	Normal	205	85.4
	Polyhydramnios	18	7.5
	Oligohydramnios	17	7.1
Vaginal bleeding	No	204	85.8
	yes	36	14.2
Twin delivery		19	7.9
Mode of presentation	Vertex	192	80
	Transverse	17	7.1
	Breech	32	12.9
Delivery	Normal	144	60
	Cesarean section	96	40

Table (2.1) Distribution of the studied hydrocephalic infants according to Sociodemographic characteristics and risk factors

Variable		hydrocephalus	normal	Chi square	P value
Infant's characteristics					
Number of infants		250	600		
Age (in months)	Mean	3.392	14.150	t test	0.02 (S)
	SD	2.237	25.973	1.290	
	Range	1-6	1-36		
Maternal risk factors					
Maternal age (in years)	Mean	22.625	33.930	t test	<0.001 (HS)
	SD	8.735	4.928	4.934	
	Range	15-39	25-39		
Mother age <20 years	Yes	60	53	20.372	<0.001 (HS)
	No	180	547		
Parity	Unipara/ nullipara	90	345	3.915	0.048 (S)
	Multipara	150	255		
DM		33	78	4.175	0.041(S)
Fever		77	286	3.477	0.02 (S)
Exposure to irradiation		32	26	10.074	0.002 (S)
Contact with infectious case		37	91	4.438	0.035 (S)
Smoking	Active	2	6	9.870	0.007 (S)
	Passive	180	154		
	Non	58	320		
Drug intake		153	320	4.071	0.044 (S)
Contact with pollutant		37	169	0.329	0.566 (NS)
Family risk factors					
Consanguinity		138	77	22.941	<0.001 (HS)
Family history		50	78	11.289	0.001 (S)
Age of the father	<50 years	167	540	11.332	0.001 (S)
	>50 years	73	160		

*P<0.05 significant **P<0.01 highly significant

Table (2.2) Distribution of the studied hydrocephalic infants according to Sociodemographic characteristics and risk factors

Variable		hydrocephalus	normal	Chi square	P value
Pregnancy and labor risk factors					
Period of gestation (in months)	Mean	8.563	8.605	t test	0.01 (S)
	SD	0.706	0.686	0.510	
	Range	6-9	8.5-9.5		
Antenatal care	Good	116	493	4.637	0.05 (S)
	poor	124	107		
Previous abortion or stillbirth		64	128	3.635	0.057 (NS)
Preeclampsia		18	51	2.467	0.01 (S)
Amniotic fluid	Normal	205	510	2.690	0.05 (S)
	Polyhydramnios	18	36		
	Oligohydramnios	17	54		
Vaginal bleeding	No	204	525	0.616	0.432 (NS)
	Yes	36	75		
Twin delivery		19	30	0.915	0.03 (S)
Mode of presentation	Vertex	192	428	1.705	0.426 (NS)
	Transverse	17	65		
	Breech	31	107		
Delivery	vaginal	144	492	6.014	0.014 (S)
	Cesarean section	96	108		

Table (3) Multivariate logistic regression analysis of risk factors which approved to be significant by univariate logistic regression analysis

Variables	B	S.E.	Wald	Sig.	Odd's Ratio	95% C.I.for EXP(B)	
						Lower	Upper
Sex(male)	-0.010	0.010	0.998	0.03	1.990	0.971	1.010
Mother age	5.722	1.758	10.593	0.001	305.421	9.738	9579.000
Parity	0.691	0.660	1.096	0.295	0.995	0.548	7.271
DM	2.988	1.024	8.524	0.004	19.855	2.670	147.625
Fever	1.316	0.669	3.870	0.049	3.728	1.005	13.833
Exposure to irradiation	2.076	1.183	3.078	0.039	7.970	0.784	81.019
Contact with infectious case	0.107	1.027	0.011	0.917	1.113	0.149	8.338
Smoking	0.196	1.728	0.113	0.021	1.843	0.191	3.714
Drug intake	-0.474	0.795	0.356	0.05	1.622	0.131	2.957
Pollutant contact	0.051	0.643	0.006	0.937	1.052	0.298	3.711
Consanguinity	0.919	0.528	3.036	0.018	2.508	1.892	7.053
FH	2.357	0.850	7.684	0.006	10.560	1.995	55.907
Age of father	1.720	0.663	6.742	0.009	5.587	1.525	20.474
Antenatal care	3.286	1.354	5.891	0.015	26.747	1.883	380.033
Abortion or stillbirth	-0.398	0.740	0.289	0.591	0.672	0.157	2.865
Preeclampsia	1.223	1.505	0.660	0.016	3.398	0.178	64.943
Amniotic fluid	-2.411	1.693	2.028	0.154	0.090	0.003	2.478
Vaginal bleeding	0.941	0.892	1.114	0.291	0.563	0.446	14.716
Twin delivery	1.171	0.922	1.613	0.204	3.225	0.529	19.656
Period of gestation	-0.325	0.443	0.539	0.003	3.722	0.303	1.721
Mode of presentation	-1.386	1.512	0.840	0.359	0.250	0.013	4.844
Mode of Delivery	1.538	0.530	8.402	0.004	4.653	1.645	13.160
Constant	-18.482	6.477	8.144	0.004	0.000		

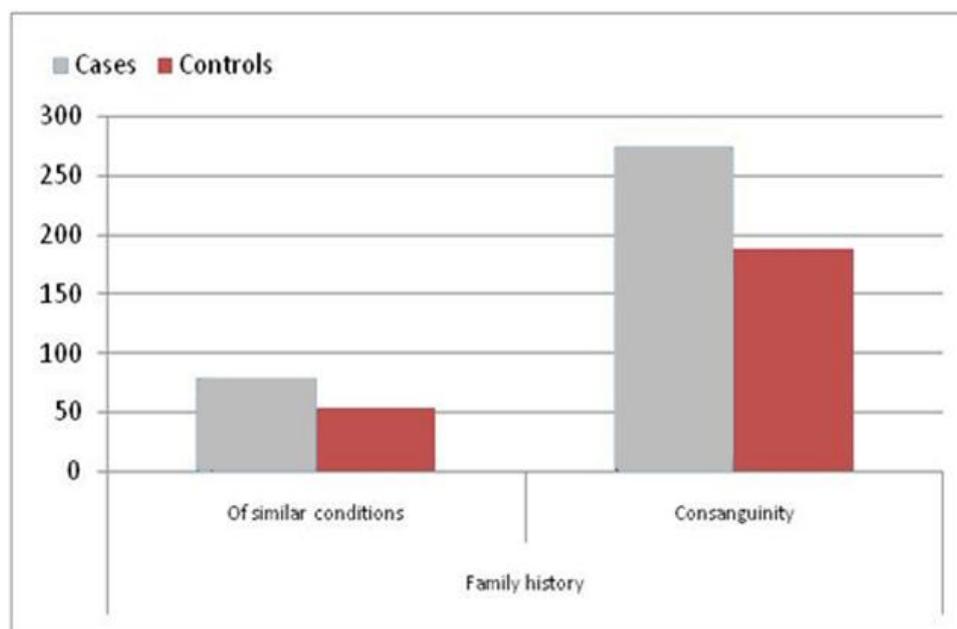


Figure (1); shows the relationship of family history to occurrence of congenital hydrocephalus

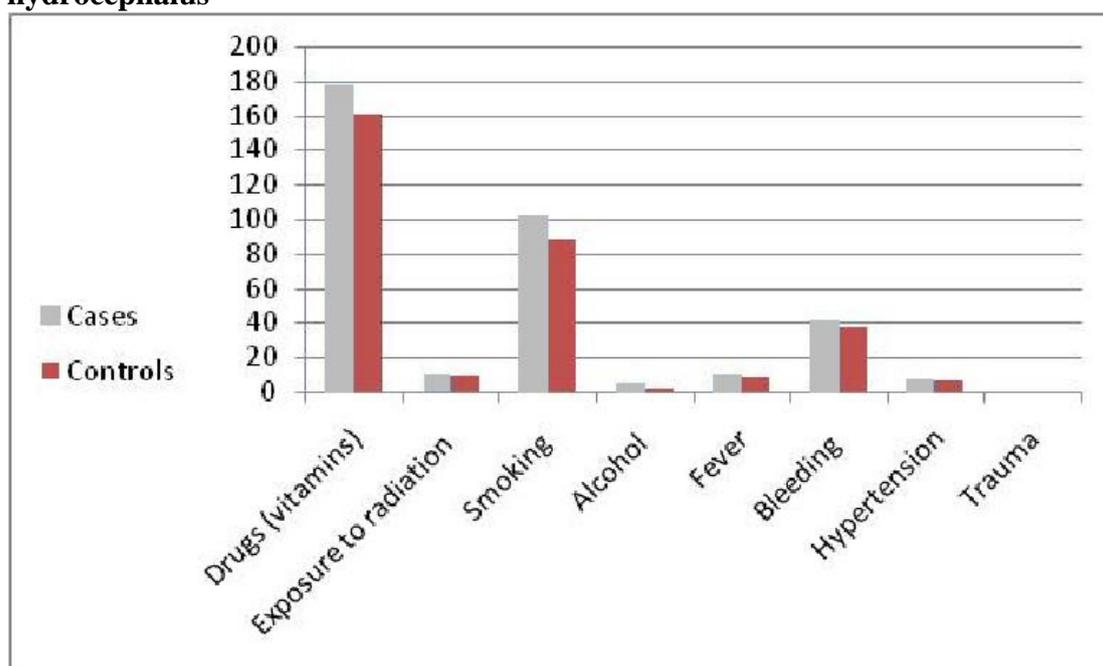


Figure (2); shows the relationship of risk factors to occurrence of congenital hydrocephalus.