Some Risk Factors in children with cerebral palsy (A meta-analysis on Egyptian studies 2000-2017)

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Abstract

Background: Cerebral Palsy (CP) is a group of disorders that characterized by long term disability which affects the developmental process with consequent negative impact on the general status of CP children.

Objective: To provide the first meta- analysis of Egyptian studies regarding risk factors (prenatal, natal and postnatal) in children with CP.

Methodology: According to PRISMA statement, the researcher reviewed the Egyptian theses, papers, journals, in English language, searching for the eligible studies published from January, 2000 to the end of June, 2017. Meta- analysis was done using MedCalc software ver. 12.7.7.0. The pool of 78 studies involved a total sample of 7338 children with CP and 961 control children (26 articles directly related to to risk factors in relation to CP.

Results: Positive consanguinity in CP children had an Odds Ratio 1.7 (Z= 2.25, P= 0.024). The prevalent risk factors pooled random effect proportions in CP children are: hypoxic ischemic encephalopathy 54.4%, recurrent chest infections 62.3%, epilepsy 47%, 1st birth order 43.2%, birith asphyxia 40.3%, difficult labor 35%, brain atrophy 34%, hospital delivery 32%, prenatal risk factors 22%, prematurity 22%, postnatal risk factors 20.2%, neonatal jaundice in 18%, positive family history 16% and premature rupture of membranes 15.3%,

oConclusion: There is insufficient evidence to implicate any factor in CP etiology. There is a need for large, prospective, population- based studies with the goal of elucidating the modifiable risk factors.

Keywords: CP, Children, Risk factors, Prenatal, Natal, Posnatal, Meta- analysis.

دراسة بعض عوامل الاختطار في الأطفال المصابين بالشلل الدماغي (تحليل ميتا (البعدى) على الدراسات المصرية)

الخلفية: مرض الشلل الدماغي في الاطفال عبارة عن اضطراب الحركة والتي تسبب قصور في النشاط الحركي. وهذا المرض ينتج من خلال في مراحل نمو المخ المختلفة اثناء الحياة الجنينية او في مرحلة مابعد الولادة مباشرة. وهناك اسباب تتعلق بمرحلة الحمل ومايتعرض له الجنين والام من عوامل واثناء عملية الولادة مثل نقص الاكسجين والدم في المخ للجنين اثناء الولادة، و مابعد الولادة مثل التهاب اغشية المخ او التهاب المخ.

الهدف: يهدف البحث الى دراسة عوامل الخطورة في الأطفال المصابين بمرض الشلل الدماغي بمسح المرجعيات الطبية المصرية.

المنهجية: تصميم البحث: استخدام التحليل البعدى من الدراسات أسابقة ألمصرية والرسائل العلمية وألا بحاث التى تتعرض لعوامل الخطورة في أطفال الشلل الدماغي. قام الباحث بزيارة المكتبات المركزية والرقمية في الجامعات المصرية وذلك للبحث عن الرسائل العلمية والابحاث الطبية في مرضي الشلل المخي في الاطفال وذلك في كليات الطب (من عام ٢٠٠٠ الي عام ٢٠١٧) وقد تم الحصول علي ٧٨ دراسة مصرية، تم ادخال هذه البيانات في برنامج تحليل ميتا البعدي الطبي، اصدار رقم ٢ وذلك لتحديد حجم الاثر.

النتائج: ان من اهم عوامل الخطورة المسببة لمرض الشلل المخي في الاطفال، نقص الدم والاكسجين عن المخ (الاختناق الوليدي) بنسبة حدوث ٥٤,٥% يلي ذلك الطفل الاول في العائلة وكانت نسبة حدوث الشلل المخي ٤٣,٢% ثم الولادة المتعثرة وكانت نسبة الخطورة ٣٥,٠٩% وزواج الاقارب بنسبة خطورة ٣٢,٢%.

التوصيات: يوصي البحث بعمل برنامج متكامل خاص بمرضي شلل المخ في الاطفال وذلك لتوعية وتعليم هؤلاء الاطفال ومن يقومون برعايتهم، كيفية معالجة هذه المشكلات المصاحبة والتغلب عليها.

Introduction:

CP is a group of disorders of the development of movement and posture causing activity limitation that are attributed to non- progressive disturbances which occurred in the developing fetal or infant brain (Bax et.al., 2005).

CP is currently classified according to motor impairment, anatomical distribution, and functional level (Rosenbaum et.al., 2007).

Meta- analysis is an epidemiological technique for summarizing and reviewing previous quantitative research. Good meta- analysis aim for increasing statistical power, investigating risks associated with diseases and to generalized results of single studies (Ioannidis, 2005).

Importance Of The Study:

As the prevalence of cerebral palsy all over the world and at Arabic society is increasing, it is important to identify risk factors on an evidence based helping in the diagnosis and management.

Aim Of The Study:

The aim of the present study is to provide the first meta- analysis of Egyptian research regarding some risk factors in children with CP.

Methodology

Search Strategy:

The search parameters included keywords regarding the target population (CP) and risk factors- related variables. Reviewers' cross-checked search results and removed overlapping citations.

Study identification and eligibility criteria:

According to guidelines outlined by the Preferred Reporting Items for Systematic Review and Meta- analysis (PRISMA) statement, the search made in Eulc, Epic, Medline, and other databases which were published between January 2000 and the end of June, 2017. The researcher reviewed the theses, papers, journals, in Egyptian studies in English language, searching for the eligible studies.

Statistical Analysis:

The most common measures of effect size used for data are the risk ratio and the odds ratio. The dominant method used for continuous data are standardized mean difference (SMD) estimation. The analytical methods used in meta- analysis include heterogeneity analysis, sensitivity analysis and evaluation of publication bias. In the random- effect analysis, we assume that the true effect size varies from one study to the next, and that the studies in our analysis represent a random sample of effect sizes that could have been observed (Borenstein et.al., 2005). Data were recorded using SPSS ver.12.01 (2003). Metaanalysis was done using MedCalc software ver. 12.7.7.0.

Results:

Table and Plot (1) show positive consanguinity in 59 CP children and 39 controls. Odds ratio=1.7, Z= 2.25, P= 0.024. {Q= 1.72, P= 0.42, I2=0.00, 95% CI=0.00 – 96.1}.

Table (1) Meta- analysis: consanguinity among CP& controls

| Study	Cases	Controls	Odds Ratio	95% Ci	(z)	P	Weight (%)	
							Fixed	Random
AL- sharareef et.al. 2016	14/50	2/20	3.500	0.717 to 17.094			10.03	10.03
EL- ghalban et.al. 2013	42/103	34/123	1.802	1.032 to 3.147			81.25	81.25
Elsisi., El-meshad 2017	3/30	3/23	0.741	0.135 to 4.061			8.72	8.72
Total (Fixed Effects)	59/183	39/166	1.813	1.103 to 2.979	2.348	0.019	100.00	100.00
Total (Random Effects)	59/183	39/166	1.783	1.079 to 2.946	2.256	0.024	100.00	100.00
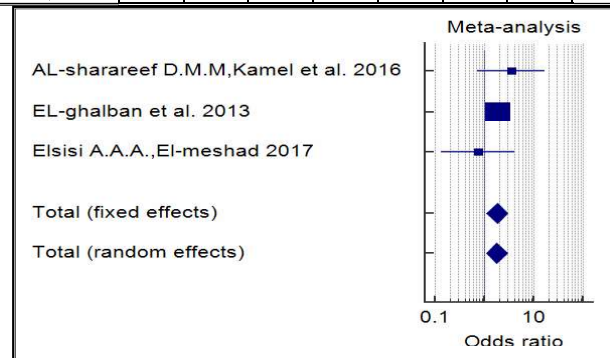
Table and Plot (2) show that positive family histories in 1077 CP patients, proportion was 16.04%. {Q= 145.3, P< 0.0001, I2=92.8%, 95% CI=89.3– 95.2}.

Table (2) Meta- analysis proportion of positive family history among CP children

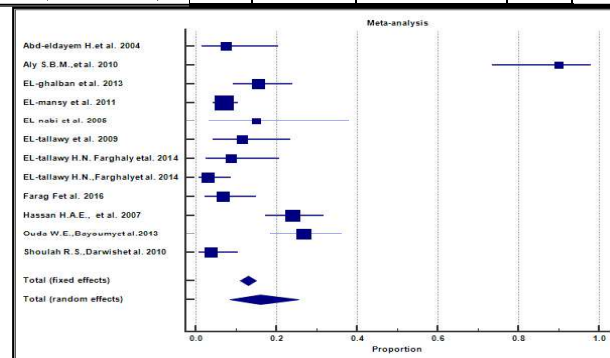| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abd- eldayem et.al. 2004	40	7.500	1.574 to 20.386	3.76	7.97
AlyS. B. M., et.al. 2010	30	90.000	73.471to 97.888	2.85	7.63
EL- ghalban et.al. 2013	103	15.534	9.148 to 23.997	9.55	8.70
EL- mansy et.al. 2011	286	6.993	4.324 to 10.594	26.35	9.04
EL- nabi et.al. 2005	20	15.000	3.207 to 37.893	1.93	7.04
EL- tallawy et.al. 2009	52	11.538	4.354 to 23.441	4.87	8.23
EL- tallawy et.al. 2014	46	8.696	2.420 to 20.792	4.32	8.11
EL- tallawy et.al. 2014	98	3.061	0.636 to 8.686	9.09	8.67
Faragf et.al. 2016	75	6.667	2.200 to 14.876	6.98	8.51
Hassan H., et.al. 2007	142	23.944	17.187 to 31.81	13.13	8.84
Ouda Et.Al. 2013	105	26.667	18.507 to 36.18	9.73	8.71
Shoulah Et.Al. 2010	80	3.750	0.780 to 10.570	7.44	8.55
Total (Fixed Effects)	1077	12.925	10.989 to 15.06	100.00	100.00
Total (Random Effects)	1077	16.041	8.514 to 25.387	100.00	100.00

Table and Plot (3) show neonatal jaundice in 394 CP patients, proportion was 18.1%. {Q= 119.5, P< 0.0001, I2= 95.8%, 95% CI= 93.1– 97.4}.

Table (3) Meta- analysis proportion of Neonatal Jaundice among CP

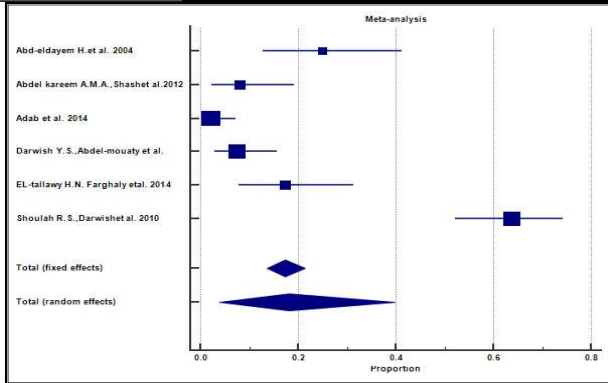| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abd- eldayem H. et.al. 2004	40	25.000	12.691 to 41.196	10.25	16.32
Abdel Kareem A., et.al. 2012	50	8.000	2.223 to 19.234	12.75	16.53
Adab et.al. 2014	98	2.041	0.248 to 7.178	24.75	16.97
Darwish Y., Abdel-mouaty et.al.	80	7.500	2.802 to 15.613	20.25	16.86
EL- Tallawy H. Farghaly etal. 2014	46	17.391	7.820 to 31.419	11.75	16.46
Shoulah R.S., Darwish et.al. 2010	80	63.750	52.239 to 74.211	20.25	16.86
Total (Fixed Effects)	394	17.279	13.702 to 21.347	100.00	100.00
Total (Random Effects)	394	18.111	3.834 to 39.745	100.00	100.00

Table and Plot (4) show neonatal seizures in 1898 CP patients, proportion was 25.9%. {Q= 272.6, P< 0.0001, I2=96.7%, 95% CI=95.3–97.6}.

Table (4) Meta- analysis proportion of Neonatal Seizures among CP

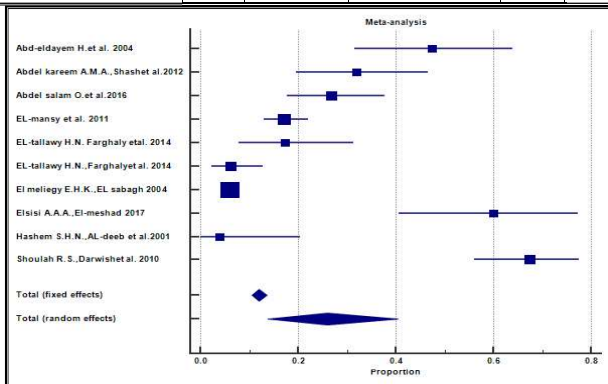| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abd- eldayem H. et.al. 2004	40	47.500	31.512 to 63.872	2.15	9.71
Abdel kareem et.al. 2012	50	32.000	19.520 to 46.699	2.67	9.89
Abdel salam O. et.al. 2016	82	26.829	17.639 to 37.756	4.35	10.20
EL- Mansy et.al. 2011	286	17.133	12.952 to 22.010	15.04	10.57
EL- Tallawyetal. 2014	46	17.391	7.820 to 31.419	2.46	9.83
EL- Tallawy et.al. 2014	98	6.122	2.280 to 12.851	5.19	10.28
El Meliegy 2004	1161	5.943	4.653 to 7.462	60.90	10.69
Elsisi., El- meshad 2017	30	60.000	40.603 to 77.34	1.62	9.42
Hashem Et.Al. 2001	25	4.000	0.101 to 20.352	1.36	9.20
Shoulah Et.Al. 2010	80	67.500	56.106 to 77.55	4.25	10.19
Total (Fixed Effects)	1898	12.012	10.586 to 13.55	100.00	100.00
Total (Random Effects)	1898	25.933	13.754 to 40.38	100.00	100.00

Table and Plot (5) show prematurity in 4075 CP patients, proportion was 22%. {Q= 267.9, P< 0.0001, I2=92.9%, 95% CI=90.3– 94.7}.

Table (5) Meta- analysis proportion of Prematurity among CP

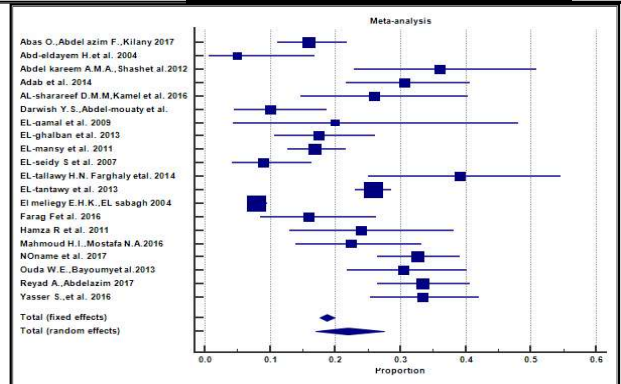| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
AbasO., Abdelazim F., Kilany 2017	200	16.000	11.209 to 21.83	4.91	5.46
Abd- eldayem H. et.al. 2004	40	5.000	0.611 to 16.920	1.00	4.36
Abdel kareem A, Shash et.al. 2012	50	36.000	22.916 to 50.80	1.25	4.59
Adab Et.Al. 2014	98	30.612	21.698 to 40.73	2.42	5.12
AL- sharareef D, Kamel et.al. 2016	50	26.000	14.630 to 40.34	1.25	4.59
Darwish Y. Abdel-mouaty et.al.	80	10.000	4.417 to 18.757	1.98	4.98
EL- gamal et.al. 2009	15	20.000	4.331 to 48.089	0.39	3.13
EL- ghalban et.al. 2013	103	17.476	10.699 to 26.20	2.54	5.15
EL- mansy et.al. 2011	286	16.783	12.641 to 21.62	7.01	5.57
EL- seidy S et.al. 2007	100	9.000	4.198 to 16.398	2.47	5.13
EL- tallawy H. Farghalyetal. 2014	46	39.130	25.088 to 54.62	1.15	4.51
EL- tantawy et.al. 2013	1000	25.800	23.113 to 28.63	24.44	5.76
El meliegy E., EL sabagh 2004	1161	7.924	6.436 to 9.630	28.38	5.77
Faragf et.Al. 2016	75	16.000	8.550 to 26.281	1.86	4.94
Hamza R et.al. 2011	50	24.000	13.061 to 38.16	1.25	4.59
Mahmoud H. I., Mostafa N. A. 2016	80	22.500	13.914 to 33.20	1.98	4.98
Noname Et.Al. 2017	224	32.589	26.496 to 39.15	5.49	5.50
Ouda W. E., Bayoumy et.al. 2013	105	30.476	21.867 to 40.22	2.59	5.16
Reyad A., Abdelazim 2017	180	33.333	26.496 to 40.73	4.42	5.42
Yasser S., et.al. 2016	132	33.333	25.373 to 42.06	3.25	5.29
Total (Fixed Effects)	4075	18.752	17.567 to 19.98	100.00	100.00
Total (Random Effects)	4075	22.017	16.985 to 27.50	100.00	100.00

Table and Plot (6) show birth asphyxia in 179 CP patients, proportion was 40.3%. {Q= 46.4, P< 0.0001, I 2=95.6% and 95% CI=90.6- 98.02}.

Table (6) Meta- analysis proportion of Birth Asphyxia among CP

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abdel kareem et.al. 2012	50	42.000	28.188 to 56.794	28.02	33.53
Hashem Et.Al. 2001	25	8.000	0.984 to 26.031	14.29	32.18
Shora Et.Al. 2015	104	73.077	63.490 to 81.306	57.69	34.30
Total (Fixed Effects)	179	54.745	47.212 to 62.120	100.00	100.00
Total (Random Effects)	179	40.387	9.212 to 76.861	100.00	100.00

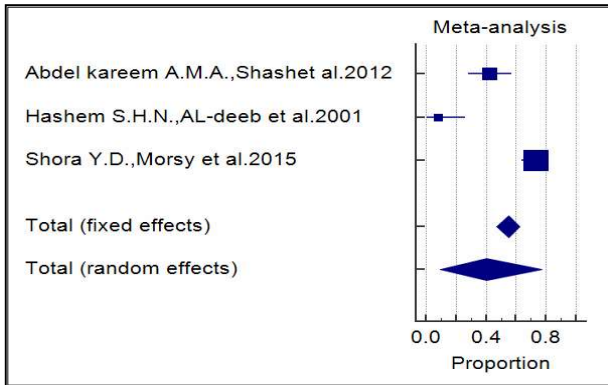**(Some Risk Factors In Children With ...)**

Table and Plot (7) show chest infection in 310 CP patients, proportion was 62.3%. {Q= 126.06, P< 0.0001, I 2=98.4, 95% CI= 97.1 – 99.1}.

Table (7) Meta- analysis proportion of Chest Infection among CP

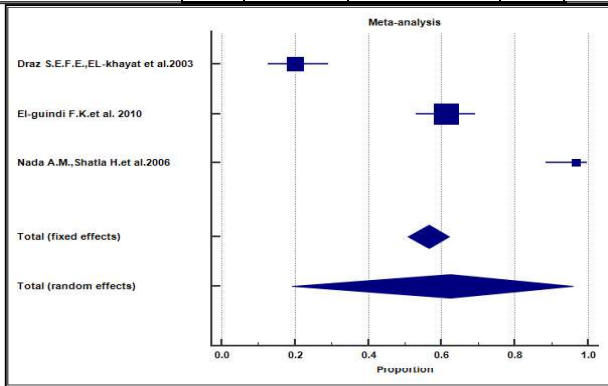| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Draz S., EL- khayat et.al. 2003	100	20.000	12.666to 9.18	32.27	33.39
El- guindi F. et.al. 2010	150	61.333	53.045o 9.16	48.24	33.56
Nada A, Shatla H. et.al. 2006	60	96.667	88.472to 9.59	19.49	33.05
Total (Fixed Effects)	310	56.549	50.858to 2.11	100.00	100.00
Total (Random Effects)	310	62.319	19.349to 5.79	100.00	100.00

Table and Plot (8) show epilepsy in 3283 CP patients, proportion was 47.1%. {Q= 241.4, P< 0.0001, I2=90.8%, 95% CI=87.6– 93.2}.

Table (8) Meta- analysis proportion of Epilepsy among CP children

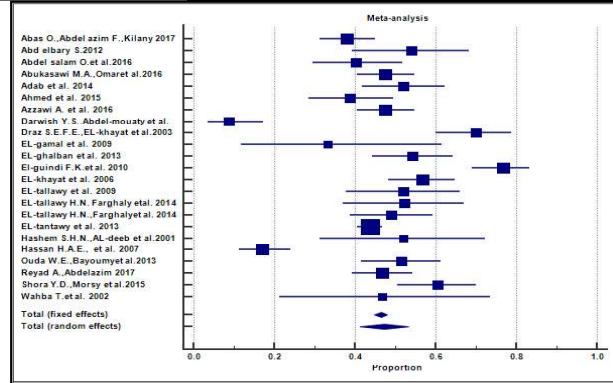| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abas, Kilany 2017	200	38.000	31.247 to 45.11	6.08	4.81
Abdelbary S. 2012	50	54.000	39.324 to 68.18	1.54	4.07
Abdel salam O. et.al. 2016	82	40.244	29.556 to 51.65	2.51	4.42
Abukasawi Et.Al. 2016	200	47.500	40.412 to 54.66	6.08	4.81
Adab Et.Al. 2014	98	52.041	41.712 to 62.24	2.99	4.52
Ahmed Et.Al. 2015	88	38.636	28.442 to 49.61	2.69	4.46
Azzawi A. et.al. 2016	200	47.500	40.412 to 54.66	6.08	4.81
Darwish Et.Al.	80	8.750	3.591 to 17.201	2.45	4.40
Draz khayat et.al. 2003	100	70.000	60.019 to 78.75	3.06	4.53
EL- gamal et.al. 2009	15	33.333	11.824 to 61.62	0.48	2.80
EL- ghalban et.al. 2013	103	54.369	44.261 to 64.21	3.15	4.54
El- guindi F. K. et.al. 2010	150	76.667	69.072 to 83.17	4.57	4.71
EL- khayat et.al. 2006	150	56.667	48.338 to 64.72	4.57	4.71
EL- tallawy et.al. 2009	52	51.923	37.631 to 65.98	1.60	4.10
EL- tallawy etal. 2014	46	52.174	36.946 to 67.11	1.42	4.00
EL- tallawy et.al. 2014	98	48.980	38.740 to 59.28	2.99	4.52
EL- tantawy et.al. 2013	1000	43.700	40.598 to 46.83	30.28	5.06
Hashem Et.Al. 2001	25	52.000	31.306 to 72.20	0.79	3.39
Hassan H., et.al. 2007	142	16.901	11.139 to 24.09	4.33	4.69
Ouda Et.Al. 2013	105	51.429	41.474 to 61.30	3.21	4.55
Reyad A., Abdelazim 2017	180	46.667	39.210 to 54.23	5.47	4.77
Shora Morsy et.al. 2015	104	60.577	50.514 to 70.02	3.18	4.55
Wahba T. et.al. 2002	15	46.667	21.267 to 73.41	0.48	2.80
Total (Fixed Effects)	3283	46.400	44.689 to 48.11	100.00	100.00
Total (Random Effects)	3283	47.183	41.135 to 53.27	100.00	100.00

Table and Plot (9) show post natal head injury in 315 CP patients, proportion was 8.9%. {Q= 1.15, P= 0.76, I2=0.00%, 95% CI= 0.00– 66.4}.

Table (9) Meta- analysis proportion of Head Injury among CP

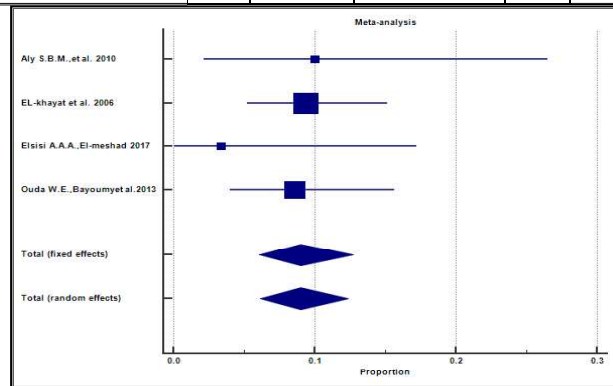| Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
AlyS. B. M., et.al. 2010	30	10.000	2.112 to 26.529	9.72	9.72
EL- khayat et.al. 2006	150	9.333	5.197 to 15.164	47.34	47.34
Elsisi El- Meshad 2017	30	3.333	0.0844 to 17.217	9.72	9.72
Ouda Et.Al. 2013	105	8.571	3.995 to 15.648	33.23	33.23
Total (Fixed Effects)	315	8.994	6.092 to 12.684	100.00	100.00
Total (Random Effects)	315	8.994	6.107 to 12.374	100.00	100.00

Table and Plot (10) show hospital delivery mode among 569 CP patients, proportion was 32.05%. {Q= 173.6, P< 0.0001, I2=98.2%, 95% CI=97.1– 98.9}.

Table (10) Meta- analysis proportion of Hospital Delivery Mode among CP children

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
EL- ghalban et.al. 2013	103	30.097	21.450 to 39.924	18.15	24.96
EL- mansy et.al. 2011	286	71.329	65.710 to 76.499	50.09	25.30
EL- seidy S et.al. 2007	100	23.000	15.173 to 32.486	17.63	24.94
Mahmoud Mostfa 2016	80	8.750	3.591 to 17.201	14.14	24.81
Total (Fixed Effects)	569	45.618	41.484 to 49.797	100.00	100.00
Total (Random Effects)	569	32.053	7.152 to 64.541	100.00	100.00

Table and Plot (11) show difficult labor among mothers of 572 CP

patients, proportion was 35.09%. {Q= 287.8, P< 0.0001, I2=97.5%, 95% CI=96.5–98.3}.

Table and Plot (12) show first birth order in 1106 CP patients, proportion was 43.2%. {Q= 59.6, P< 0.0001, I2=88.2%, 95% CI=79.1–93.3}.

Table (11) Meta- analysis proportion of Difficult Labor among mothers of CP children

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abdelkareem.e t al. 2012	50	30.000	17.862 to 44.608	8.79	12.49
Adab Et.Al. 2014	98	25.510	17.239 to 35.314	17.07	12.70
Darwish Et.Al.	80	16.250	8.946 to 26.184	13.97	12.65
EL- gamal et.al. 2009	15	33.333	11.824 to 61.620	2.76	11.64
EL- ghalban et.al. 2013	103	7.767	3.413 to 14.731	17.93	12.71
EL- seidy S et.al. 2007	100	88.000	79.976 to 93.643	17.41	12.70
EL- Tallawyetal. 2014	46	8.696	2.420 to 20.792	8.10	12.46
Mahmoud M 2016	80	78.750	68.171 to 87.10	13.97	12.65
Total (Fixed Effects)	572	37.438	33.486 to 41.51	100.00	100.00
Total (Random Effects)	572	35.091	12.994 to 61.28	100.00	100.00

Table (13) Meta- analysis proportion of Postnatal Factors

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abdel salam O. et.al.2016	82	12.195	6.006 to 21.286	5.13	13.99
Abu elazm et.al. 2010	50	66.000	51.235 to 78.795	3.15	13.20
Adab Et.Al. 2014	98	28.571	19.897 to 38.583	6.12	14.21
Ahmed Et.Al. 2015	88	21.591	13.528 to 31.645	5.50	14.08
El- guindi F. K. et.al. 2010	150	14.667	9.426 to 21.359	9.34	14.62
EL- tantawy et.al. 2013	1000	17.100	14.816 to 19.580	61.90	15.33
Hassan H.A.E., et.al. 2007	142	1.408	0.171 to 4.995	8.84	14.57
Total (Fixed Effects)	1610	16.836	15.043 to 18.751	100.00	100.00
Total (Random Effects)	1610	20.288	10.921 to 31.667	100.00	100.00

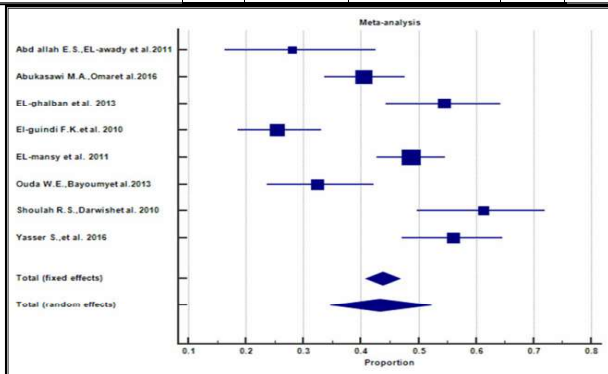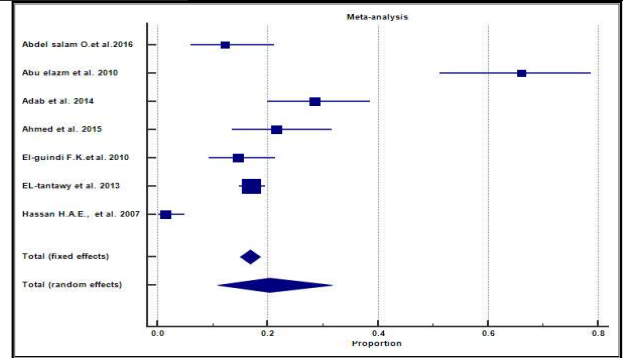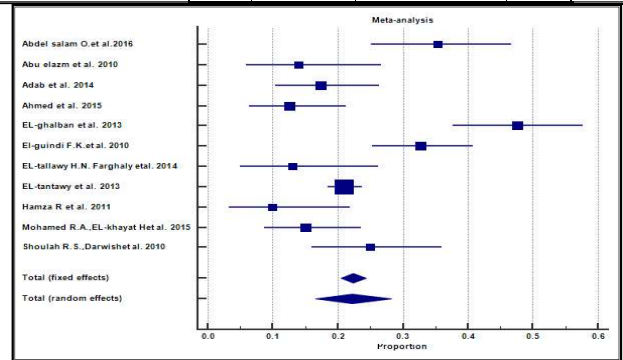Table and Plot (14) show prenatal risk factors in 1847 CP patients, proportion was 22.1%. {Q= 66.5, P= 0.0001, I 2=84.9% and 95% CI 74.7-91.04}.

Table (14) Meta- analysis proportion of Prenatal Factors

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abdel salam O. et.al. 2016	82	35.366	25.118 to 46.704	4.47	9.01
Abu elazm et.al. 2010	50	14.000	5.819 to 26.740	2.74	7.94
Adab Et.Al. 2014	98	17.347	10.442 to 26.315	5.33	9.33
Ahmed Et.Al. 2015	88	12.500	6.408 to 21.266	4.79	9.14
EL- ghalban et.al. 2013	103	47.573	37.640 to 57.649	5.60	9.41
El- guindi F. K. et.al. 2010	150	32.667	25.240 to 40.793	8.13	9.97
EL-Tallawy H. Farghaly et.al. 2014	46	13.043	4.941 to 26.257	2.53	7.74
EL- tantawy et.al. 2013	1000	21.000	18.514 to 23.658	53.88	11.20
Hamza R et.al. 2011	50	10.000	3.328 to 21.814	2.74	7.94
Mohamed R., et.al. 2015	100	15.000	8.645 to 23.531	5.44	9.36
Shoulah R. S., Darwish et.al. 2010	80	25.000	15.988 to 35.936	4.36	8.96
Total (Fixed Effects)	1847	22.360	20.484 to 24.324	100.00	100.00
Total (Random Effects)	1847	22.111	16.605 to 28.162	100.00	100.00

Table (12) Meta- analysis proportion of first Borne among cases

Study	Sample Size	Proportion (%)	95% Ci	Weight (%)	
				Fixed	Random
Abd Allah E. S., EL- awady et.al. 2011	50	28.000	16.231 to 42.491	4.58	10.73
Abukasawi M..A., Omar et.al. 2016	200	40.500	33.633 to 47.652	18.04	13.30
EL- ghalban et.al. 2013	103	54.369	44.261 to 64.219	9.34	12.36
El- guindi F. K. et.al. 2010	150	25.333	18.593 to 33.074	13.55	12.95
EL- mansy et.al. 2011	286	48.601	42.675 to 54.557	25.76	13.63
Ouda W.E., Bayoumy et.al. 2013	105	32.381	23.574 to 42.211	9.52	12.39
Shoulah R.S., Darwish et.al. 2010	80	61.250	49.698 to 71.943	7.27	11.87
Yasser S., et.al. 2016	132	56.061	47.161 to 64.682	11.94	12.77
Total (Fixed Effects)	1106	43.692	40.754 to 46.663	100.00	100.00
Total (Random Effects)	1106	43.281	34.680 to 52.092	100.00	100.00

Table and Plot (13) show postnatal risk factors in 1610 CP patients,

Discussion:

Prematurity in the present meta- analysis, 20 studies with 4075 CP children, pooled random effect proportion was 22.01%. In Qatar, Al- Sayed et.al. (1998) reported that 53% of CP children were premature out of 202. Similarly, in Saudi study conducted by Gabr et.al. (2016), 40.4% were premature out of 250 CP children. These two studies are in agreement with our study. Al- Sulaiman et.al. (2003) found that 20% of children were premature out of 187.

But in Libya, 8.6% of CP children were premature out of 116. (Ashour et.al., 2013), in South Jordan study, Nafi (2011) found that prematurity in CP patient's occured14.8% out of 122 and in other Saudi Arabia,

Difficult labor in the present meta- analysis, 8 studies with 572 CP children showed that the proportion was 35.09%. In Turkey, Fidan et.al. (2014) found that difficult labor occurred in 33.8% out of 130 CP children' mothers and this agree with our study.

In contrast, in Qatar, instrumental difficult labor occurred in9.9% out of 202 CP mothers (Al- Sayed et.al., 1998), in Saudi study, Al- Soliman et.al. (2003) difficult labor occurred in8% out of 187 CP mothers and in India, Nabanita et.al. (2016) reported that difficult labor occurred in 7% out of 100 CP mothers.

Birth asphyxia in the present meta- analysis, 3 studies with 179 CP children, and the proportion was 40.3%. In Libyan study, Ashour et.al. (2013) mentioned that birth asphyxia occurred in 36% out of 116 CP children. In Saudi study, Gabr et.al. (2016) reported that 48% out of 250 CP children had birth asphyxia. In Turkish study, Fidan et.al. (2014) mentioned that birth asphyxia occurred in 52.2% out of 130 CP children. In Indian study, Nabanita et.al. (2016) found that birth asphyxia occurred in 57% out of 100 CP children. In Danish study, Frilis et.al. (2015) found that birth asphyxia occurred in 69.6% out of 43 CP children. In another Saudi study, Al- Sulaiman et.al. (2003) reported that birth asphyxia occurred in 165 out of 187 CP children, which occurred in 88.2%. But in Qatar, Al- Sayed et.al. (1998) found that birth asphyxia occurred in 10% out of 202 CP children and in Spain, Devesa et.al. (2010) reported that birth asphyxia occurred in 8.7% out of 46 CP children.

Neonatal jaundice in the present meta- analysis, 6 studies with 394 CP children the propotion was 18.1%. Nabanita et.al. (2016) in Indian study, found that neonatal jaundice was present in 14% out of 100 CP children, In Egypt, Shawky et.al. (2017) mentioned that neonatal jaundice was present in 14.1% out of 184 CP. Children and in Turkey, neonatal jaundice was present in 14.9% out of 130 CP children. (Fidan et.al., 2014).

In contrast, Gabr et.al. (2016) in a Saudi study reported that neonatal jaundice was diagnosed in 80.8% out of 250 CP children and In Jordan study, Nafi (2011) found that 29.5% out of 122 CP children were having neonatal jaundice.

History of neonatal seizures in the present meta- analysis, 10 studies with 1898 CP children, and the proportion was 26%. In Libya, Ashour et.al. (2013) found that neonatal seizures occurred in 54%of CP children out of 116 children and Nafi (2011) in Jordan study found that neonatal

seizures occurred in 35.5% out of 122 CP children. In contrast, Fidan et.al., 2014 in Turkey study, mentioned that neonatal seizures occurred in 18.5% out of 130 CP children.

Epilepsy in the present meta- analysis, 23 studies with 3283 CP children, and the proportion was 47.1%. This agree with the Indian study by Nabanita et.al. (2016) who reported that epilepsy occured48% out of 100 CP children. In Norway, epilepsy was found in 13 children out of 35 CP children (37.1%) (Dahl et.al., 1996). Fidan et.al. (2014) in Turkish study, found that epilepsy was present in 36.1% out of 130 CP children. Al- Asmari et.al. (2006) in a Saudi study showed that epilepsy was found in 25% (103 out of 412 CP children) and in Jordan study, Saleh and Almasri (2015) found that epilepsy was present in 14.7% out of 116 CP children, all of these studies are against the results of our study.

Recurrent chest infections in the present meta- analysis, 310 CP children were analyzed with proportion 62.3%. In contrast to our results, May et.al. (2014) in Myanmar, mentioned that recurrent pneumonia was present in 24.9% out of 173 CP children, in Jordan study, Saleh and Almasri (2015) mentioned that respiratory diseases occurred in 18.1% of 116 CP children and In Turkey study, Fidan et.al. (2014) reported chest infections in 9.2% out of 130 CP.

Consanguinity in the present meta- analysis, 3 studies with 183 CP children, and the proportion was 32.2%. In South Jordan study, Nafi et.al. (2011) reported that positive consanguinity was present in 65 out of 122 CP children which occured in53.3%, in Egyptian study, Shawky et.al. (2017) found that positive consanguinity was present in 75 (40.8%) out of 184 CP children and In Turkish study, Fidan et.al. (2014) reported positive consanguinity in 32 (24.6%) out of 130 CP children. In contrast, Nabanita et.al. (2016) in an Indian study reported that positive consanguinity was present in 2% of cases only.

Positive family history in the same family in the present meta- analysis, 12 studies with 1077 CP children and the proportion was 16.04%. In contrast to our study are in Sudan, Mohamed et.al. (2016) reported that positive family history was found in 3.8% and P= 0.086 (insignificant). in Saudi study, Al- Soliman et.al. (2003) reported that positive family history was present in 4% of CP children out of total number, 187 and in India, Nabanita et.al. (2016) found that 8% out of 100 CP children have positive family history of having similar CP children in the same family.

As regard first order birth, in the present meta- analysis, 8 studies with 1106 CP, and the proportion was 43.2%. In south Jordan, Nafi (2011) reported that 1st order birth in CP children occurred in 34.4% 122 CP children and in India, Nabanita et.al. (2016) found that 1st order birth occurred in70% out of 100 CP children. Our results lay in- between these two studies.

Post natal risk factors in the present meta- analysis, 7 studies with 1610 CP children, the proportion was 20.2%. This is higher than that revealed by Al- Asmari et.al. (2006) in Saudi study mentioned that post natal risk factors account for 6.8% out of 412 CP children.

Prenatal risk factors in 1847 CP children, in the present meta- analysis, the proportion was 22.1%, which is more or less in consistent with the Indian study conducted by Nabanita et.al. (2016) who reported that prenatal causes of CP children account for 17% out of 100 CP children.

Conclusion:

There is insufficient evidence to implicate any factor in CP etiology. There is a need for large, prospective, population- based studies with the goal of elucidating the modifiable risk factors.

Recommendations:

1. Good maternal (prenatal) and neonatal care.

2. Prophylactic measures should be taken against hypoxic ischemic encephalopathy.

3. High risk infants should receive careful pediatric follow up which includes developmental screening for early detection of developmental disability

4. Early enrollment in intervention program.

5. Genetic counseling should be an essential part in consanguineous marriage.

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