INPLASY PROTOCOL

Corresponding author:
Xingguang Chen

646364162@qq.com

Author Affiliation:
The Second Affiliated Hospital of Jiaxing University, Zhejiang Province, China.

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Risk factors of developmental dysplasia of the hip in infants: a Meta-analysis based on cohort studies

Chen, XG[1]; Liu, J[2]; Zou, CD[3]; Lu, JL[4]; Chen, G[5]; Wang, XD[6]; Xue, MF[7].

Review question / Objective: To investigate the risk factors of developmental dysplasia of the hip (DDH) in infants by Meta-analysis and provide theoretical basis for targeted early screening and diagnosis.

Eligibility criteria: Inclusion criteria: 1. The subjects were infants who have adopted DDH screening; 2. The diagnosis include physical examination, ultrasound and X-ray; 3. The purpose of the study is to explore the risk factors of DDH (at least one risk factor); 4. The research design adopts cohort study and carries out Logistic regression analysis on the data by statistical method.Exclusion criteria: 1. Descriptive studies, case-control studies, repeated reports (inclusion or exclusion depending on the quality of the literature), reviews, conference papers or only abstracts can not obtain the full text; 2. The data is not completely provided or it is difficult to extract; 3. The statistical method is chi-square test or research without statistical analysis.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 February 2023 and was last updated on 14 February 2023 (registration number INPLASY202320059).

INTRODUCTION

Review question / Objective: To investigate the risk factors of developmental dysplasia of the hip (DDH) in infants by Meta-analysis and provide theoretical basis for targeted early screening and diagnosis.

Condition being studied: Developmental dysplasia of hip (DDH) is a common hip disease in children, and the incidence rates of live births in worldwide were reported to be between 1.4‰ and 35.0‰. At present, the etiology of DDH is still uncertain, and it is generally believed that its pathogenesis is caused by the joint or mutual influence

of genetic factors and environmental factors. With the popularization of Graf ultrasound diagnosis, the current international examination modes include universal universal ultrasound screening and selective high-risk referral, both of which have their own advantages and disadvantages. The ultrasonic census system in the first-tier cities such as Beijing, Tianjin and Shanghai in China has been gradually improved. However, due to the imbalance between economic development and medical level, it is difficult to carry out ultrasonic census in other regions. In terms of the current situation, the latter may be more suitable for China's general situation.

The main problem of selective high-risk referral is how to accurately grasp the "selectivity" to avoid the missed diagnosis of DDH. According to the Guidelines for the Clinical Diagnosis and Treatment of Developmental Hip Dysplasia (0-2 years old) by the Chinese Medical Association, ultrasound examination should be carried out for those with risk factors or positive physical examination. Meta-analysis on the risk factors of DDH in the past, due to the limitation of the original literature, the risk factors of DDH were discussed only from the perspective of single factor through chi-square test. However, as a disease whose etiology is still unknown and whose occurrence, DDH is influenced by many factors including environment and heredity. We believe that we should use logistic regression analysis to explore the interaction of multiple variables. Therefore, we revised the inclusion and exclusion criteria of the literature, updated the meta-analysis to further evaluate the risk factors of DDH, which provided some guidance for the screening strategy of DDH in China.

METHODS

Participant or population: Infants who have adopted DDH screening.

Intervention: The diagnosis include physical examination, ultrasound and X-ray.

Comparator: Developmental dysplasia of hip or not.

Study designs to be included: cohort studies.

Eligibility criteria: Inclusion criteria: 1. The subjects were infants who have adopted DDH screening; 2. The diagnosis include physical examination, ultrasound and X-ray; 3. The purpose of the study is to explore the risk factors of DDH (at least one risk factor); 4. The research design adopts cohort study and carries out Logistic regression analysis on the data by statistical method.Exclusion criteria: 1. Descriptive studies, case-control studies, repeated reports (inclusion or exclusion depending on the quality of the literature), reviews, conference papers or only abstracts can not obtain the full text; 2. The data is not completely provided or it is difficult to extract; 3. The statistical method is chi-square test or research without statistical analysis.

Information sources: We performed a search in the Cochrane Library, PubMed, MEDLINE, CNKI (China National Knowledge Infrastructure), WanFang (http://g.wanfangdata.com.cn/index.html), the Chinese Biomedical Database (http://www.sinomed.ac.cn), and CQVIP (Chongqing VIP Chinese Scientific Journals Database) (up to October 2022). Search strategies included combinations of the keywords: developmental dysplasia of the hip (DDH), congenital dislocation of the hip (CDH), risk factors and factors. Search results were limited to "age 0-1 years" or "infants".All searches use the combination of subject words and free words, and all search strategies are determined after multiple pre-searches. Additionally, we checked the references of included articles and other related studies. No language restrictions were applied.

Main outcome(s): A total of 11 literature reports were included for this Meta-analysis. The results were not significant influenced by the publication bias. This Meta-analysis showed that the incidence rate of DDH is 47.99‰ in infants with risk factors, and 3.21‰ in the general population. The risk factors for DDH include female (OR=6.97, 95%CI: 5.18-9.39,

P=0.000), breech delivery (OR=4.14, 95%CI: 3.09-5.54, P=0.000), positive family history (OR=4.07, 95%CI: 2.20-7.52, P=0.000), cesarean section (OR=1.11, 95%CI: 1.01-1.21, P=0.032), oligohydramnios (OR=3.93, 95%CI: 1.29-12.01, P=0.016),swaddling (OR=6.74, 95%CI: 1.25-36.31, P=0.026), first born (OR=1.84, 95%CI: 1.49-2.53, P=0.000), combined musculoskeletal malformation (OR=2.27, 95%CI: 1.58-3.27, P=0.000), physical signs of DDH (OR=8.71, 95%CI: 2.44-31.07, P=0.001). The protective factor for DDH is premature delivery (OR=0.91, 95%CI: 0.88-0.95, P=0.000). The relationship about multiple pregnancy and low birth weight for DDH are still uncertain according this Meta-analysis.

Quality assessment / Risk of bias analysis: Cohort studies were assessed based on the Newcastle-Ottawa scale (NOS). If the NOS score of a study was＜7, it was regarded as having a significant bias, and the study would be excluded.

Strategy of data synthesis: Stata 15.0 software (StataCorp LLC, North Carolina, USA) was used for statistical analysis. Evidence of publication bias was assessed by Egger's test and Duval and Tweedie trimand fillmethod. Heterogeneity of ORs was assessed using the Q test and I2.The fixed-effects model using the Mantel-Haenzel method wad used for pooling if heterogeneity was absent (as judged by a Q-test of P>0.1 or I2<50%). Otherwise, a random-effects model using the DerSimonian-Laird method was first applied.

Subgroup analysis: Subgroup analysis is conducted to explore the source of heterogeneity.

Sensitivity analysis: Stability analysis was conducted by observing the results of fixed-effect model and sequentially removing each study.

Country(ies) involved: China (The Second Affiliated Hospital of Jiaxing University, Zhejiang Province).

Keywords: infants; developmental dysplasia of the hip (DDH) ; risk factors; cohort study; meta-analysis.

Contributions of each author:
Author 1 - Xingguang Chen.
Author 2 - Jue Liu.
Author 3 - Chengda Zou.
Author 4 - Jialing Lu.
Author 5 - Gang Chen.
Author 6 - Xiaodong Wang.
Author 7 - Mingfeng Xue.