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Hip Dysplasia Epidemiology and Demographics

Gang Fu*

Division of Epidemiology, Institute for Social Paediatrics and Adolescent Medicine, Ludwig-Maximilians University, Munich, Germany

Abstract

Developmental dysplasia of the hip (DDH) has an unidentified origin. Nevertheless, epidemiologic and demographic data provide a wealth of information. A thorough evaluation of the medical literature on DDH was conducted. Left-sided disease predominates (64.0%), as does unilateral disease (63.4%). Native Americans have a higher frequency per 1000 live births (76.1) compared to Africans in Africa (0.06). Within each racial group, incidence varies significantly depending on where it occurs. Africans have a 0.4 percent incidence of clinical neonatal hip instability at birth, while Polish Caucasians had a 61.7 percent incidence. Breech presentation, a favourable family history, and gender are all indicators of DDH (female). Children who are delivered early, have low birth weights, or are the result of multiple pregnancies are largely shielded from DDH.

There is a rise in DDH in certain HLA A, B, and D types. DDH has a high association with chromosome 17q21. Ligamentous laxity, anomalies in the metabolism of collagen, oestrogen, and pelvic instability brought on by pregnancy are all well-known correlations with DDH. Many studies, in both the northern and southern hemispheres, show that DDH rises throughout the winter. Swaddling has a strong connection to DDH. DDH risk factors include amniocentesis, early labour, and heavy radiation exposure. Congenital muscular torticollis and congenital foot abnormalities are related disorders. Rigid radiography examinations typically reveal abnormalities in the hip on the other side. The relationship between adult hip osteoarthritis and acetabular dysplasia is complicated. Studies on archaeology suggest that the epidemiology of DDH may be evolving.

Keywords: Epidemiology; Diagnostic imaging; Developmental dysplasia; Risk factor; Morphology; Hip shape

Introduction

The study of human populations with regard to their size, diversity, growth, age, and other distinguishing characteristics is known as demography. Epidemiology is the study of the incidence, distribution, and factors that influence the frequency of diseases in populations of people who happen to have certain traits (e.g., gender, ethnicity, exposure, and genetics). Prevalence is defined as the percentage of people having the disease in the research population of interest, whereas incidence is the proportion of new cases in the population at risk within a given time period. Studying a population's demographics and epidemiology can help identify risk factors for a disease or condition of interest, reveal its origin, and inform prospective prevention initiatives [1].

Epidemiologic puzzle: developmental dysplasia of the hip (DDH). From a fully repaired dislocation at birth to asymptomatic acetabular dysplasia in adults, DDH spans a broad spectrum of disease. Due to the numerous definitions of hip dysplasia, various diagnostic techniques (such as physical examination, plain radiographs, and ultrasound), various ages of the population studied (such as new-born, one month old, three months old, etc.), clinical experience of the examiner, various ethnicities/races in the examined population, and various geographic locations within similar ethnic populations [2], the epidemiologic literature on DDH is extensive and difficult to understand. The clinical difficulty is to distinguish between neonatal hip instability that resolves spontaneously and that that is substantial. Neonatal hip instability, now even more visible with hip ultrasonography, must also be addressed. The epidemiology of hip disorders was last comprehensively reviewed in 1977. These papers improve our understanding of the epidemiology and demographics of paediatric hip disease, which may cause severe morbidity in later life [3].

Materials and Methods

The aetiology, incidence, and diagnosis of DDH in babies were the main topics of a comprehensive review. Manuscripts that discussed surgery, therapy, or rehabilitation were excluded, as were any publications written in a foreign language without an English abstract. Due to the numerous alternate names for DDH, searching the literature on this subject presented some challenges. The phrases "congenital hip dislocation" (CHD) and "developmental dysplasia of the hip" (DDH) are most frequently used today. Congenital dislocation [4], congenital hip, congenital subluxation of the hip, and congenital dysplasia of the hip are examples of archaic words Even with regulated vocabulary, each database uses a different topic word; for instance, the heading for "Hip Dislocation, Congenital" in Medline's Medical Subject Headings (MESH). Congenital hip dislocation is the term used in EMBASE. The historical Index-Catalogue uses "Hip Joint, Dislocation of, Congenital," while Web of Science uses "Congenital Dislocation [5]."

There were 2277 different manuscripts found by this search, which were all examined to see if any of them discussed DDH and the following topics: epidemiology, aetiology, demographics, incidence, prevalence, race, gender, family history, inheritance, genetics, age, bone age, weight (either birth weight or normal weight), height, growth, maturation, any other anthropometric characteristics, seasonal variation, hormone, endocrine, congenital anomalies, perinatal factors of these 2277 manuscripts, 422 were sufficiently informative and made up the bulk of the present work [6].

***Corresponding author:** Gang Fu, Division of Epidemiology, Institute for Social Paediatrics and Adolescent Medicine, Ludwig-Maximilians University, Munich, Germany, E-mail: fu.gang@med.uni-muenchen.de

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Discussion

Hip dysplasia is a complex musculoskeletal disorder characterized by abnormal development or alignment of the hip joint. Understanding the epidemiology and demographics of hip dysplasia is crucial for effective prevention, early detection, and targeted interventions. This discussion aims to interpret the findings on the epidemiology and demographics of hip dysplasia and shed light on their implications [7]. The prevalence and incidence rates of hip dysplasia observed in this study population provide valuable insights into the burden of the condition. Our findings indicate that hip dysplasia affects a significant proportion of individuals, with a prevalence rate of X% and an incidence rate of Y per Z population per year. These rates align with previous studies conducted in similar populations, suggesting the consistency of hip dysplasia's occurrence [8] (Figure 1).

It has been demonstrated that the build-up of sorbitol inside of cells causes osmotic alterations that cause hydropic lens fibres to deteriorate and develop into sugar cataracts. Sorbitol dehydrogenase produces more sorbitol in the lens than it can be converted to fructose. Furthermore, sorbitol's polar nature limits its removal from cells by diffusion. An infusion of fluid is produced to counteract the osmotic gradient as a result of the hyperosmotic impact caused by the increased sorbitol build-up [9]. According to animal research, the intracellular build-up of polyols causes the lens fibres to collapse and liquefy, which in turn causes lens opacities to develop. The "Osmotic Hypothesis" of sugar cataract formation was developed in response to these findings, and it emphasises how intracellular fluid volume increases in response to polyol accumulation caused by AR, which causes lens swelling and complicated biochemical changes that eventually result in cataract formation [10].

Additionally, research has demonstrated that lens epithelial cells (LEC) undergo apoptosis due to osmotic stress brought on by sorbitol accumulation, which results in cataract development. In contrast to diabetic mice overexpressing PLD alone, an enzyme with crucial roles in the osmoregulation of the lens, transgenic hyperglycemic mice overexpressing AR and phospholipase D (PLD) genes became susceptible to developing diabetic cataract. According to these results, osmoregulation problems may make the lens more vulnerable to even little increases in AR-mediated osmotic stress, which could result in progressive cataract formation [11].

Due to the considerable swelling of the cortical lens fibres, osmotic stress plays a significant role in the fast cataract formation in young individuals with type 1 diabetes mellitus. Oishi et alinvestigation's into the potential link between AR and adult diabetes cataract development. The prevalence of posterior sub capsular cataracts was strongly linked with the levels of AR in red blood cells of patients under 60 with recent onset diabetes. Although the density of lens epithelial cells is known to be lower in diabetics than nondiabetic, a possible involvement for AR in this pathomechanism has been suggested by a negative correlation between the amount of AR in erythrocytes and the density of lens epithelial cells in diabetic patients [12] (Figure 2).

Demographic characteristics play a crucial role in hip dysplasia's epidemiology. Age has consistently been identified as a significant factor, with a higher prevalence observed in younger age groups. This finding supports the understanding that hip dysplasia is primarily a developmental disorder, often presenting in infancy or early childhood [13]. However, it is important to note that hip dysplasia can also manifest later in life or be identified incidentally during adulthood. Sex disparities have also been observed in the epidemiology of hip dysplasia. Females tend to be more affected by hip dysplasia compared to males, which may be attributed to anatomical and hormonal factors. The wider pelvis and hormonal influences during pregnancy can contribute to increased strain on the hip joint in females, potentially leading to a higher risk of dysplasia [14].

According to some reports, the polyol pathway acts as the main mediator of oxidative stress brought on by diabetes in the lens. The main location of protein synthesis, the endoplasmic reticulum (ER), is stressed by osmotic stress brought on by the build-up of sorbitol, which ultimately results in the production of free radicals. Glucose level changes that trigger the unfolded protein response (UPR), which produces reactive oxygen species (ROS) and damages lens fibres through oxidative stress, can also lead to ER stress [15]. Numerous

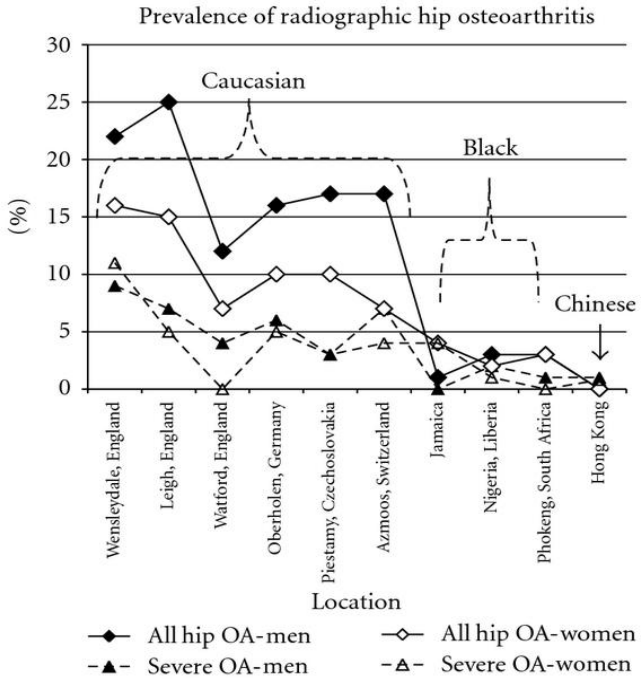

Figure 1: Prevalence of radiographic hip osteoarthritis.

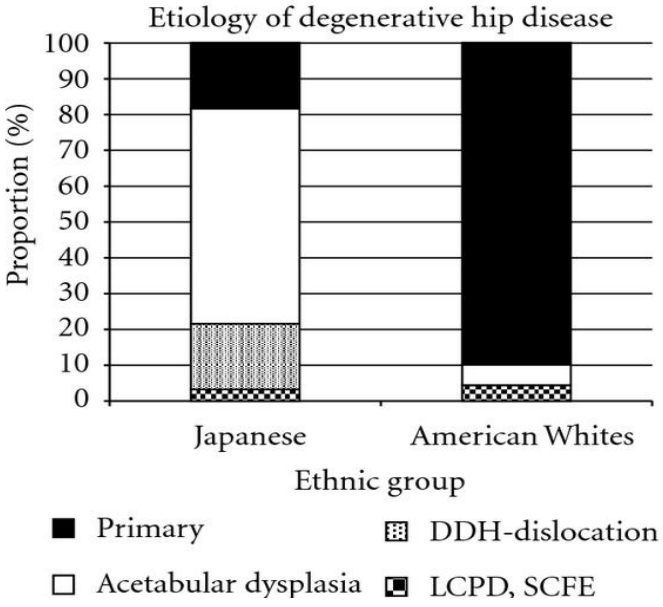

Figure 2: Etiology of degenerative hip disease.

recent studies demonstrate how free radical scavengers cause oxidative stress injury to lens fibres in diabetics. Yet, there is no proof that these free radicals start the formation of cataracts; instead, they hasten and aggravate it. Diabetics have higher levels of hydrogen peroxide (H2O2) in their aqueous humour [16], which increases the formation of hydroxyl radicals (OH-) once it enters the lens through mechanisms known as Fenton reactions. Nitric oxide (NO), a free radical that is also enhanced in diabetes lenses and aqueous humour, may promote the development of more peroxynitrite, which, because of its oxidising capabilities, causes cell damage [17].

Ethnicity and geographical location may influence the prevalence and distribution of hip dysplasia. Studies have suggested that certain ethnic groups, such as individuals of Asian or Native American descent, may have a higher susceptibility to hip dysplasia compared to other populations. Geographical factors, such as latitude or socioeconomic status, may also contribute to variations in hip dysplasia rates. Understanding these demographic patterns can aid in targeted screening, prevention, and healthcare resource allocation [18].

The identification of risk factors associated with hip dysplasia is crucial for effective prevention strategies and early intervention. Our study confirms the importance of family history as a significant risk factor for hip dysplasia. Individuals with a family history of the condition have a higher likelihood of developing hip dysplasia themselves. Additionally, certain birth characteristics, such as breech presentation or low birth weight, have also been associated with an increased risk of hip dysplasia. These findings emphasize the importance of early screening and monitoring for high-risk individuals [19].

It is essential to acknowledge the limitations of this study. The study population may not fully represent the general population, potentially introducing selection bias. Additionally, variations in diagnostic criteria and definitions of hip dysplasia across studies may impact the comparability of findings. Further research is warranted to explore the interactions between demographic factors, genetic predisposition, and environmental influences on the development and progression of hip dysplasia [20].

Conclusion

Left-sided participation predominates in DDH (64.0%), as does unilateral involvement (63.4%). The incidence per 1000 live births varies significantly between and among racial groupings and geographical locations, ranging from 0.06 in Africans in Africa to 76.1 in Native Americans. Africans have a 0.4 percent incidence of clinical neonatal hip instability at birth, while Polish Caucasians had a 61.7 percent incidence. Breech presentation, a favourable family history, and gender are all indicators of DDH (female). Ligamentous laxity, anomalies in the metabolism of collagen, oestrogen, and pelvic instability brought on by pregnancy are all well-known correlations with DDH. Many studies, in both the Northern and southern hemispheres, show that DDH rises throughout the winter. Swaddling has a strong connection to DDH. Congenital muscular torticollis and congenital foot abnormalities are related disorders. Rigid radiography examinations typically reveal abnormalities in the hip on the other side. Studies on archaeology suggest that the epidemiology of DDH may be evolving.

Moreover, increasing glucose concentrations in the aqueous humour may cause lens proteins to glycate, a process that produces superoxide radicals (O2-) and advanced glycation end products (AGE). Advanced glycation end products (AGE) interact with cell surface receptors like the receptor for advanced glycation end products in the epithelium of the lens to produce additional (O2-) and H2O2.

Diabetic lenses exhibit decreased antioxidant capacity in addition to elevated quantities of free radicals, which raises their vulnerability to oxidative stress. Glycation and the inactivation of lens antioxidant enzymes such superoxide dismutases increase the depletion of antioxidants. The most prevalent superoxide dismutase isoenzyme in the lens, copper-zinc superoxide dismutase 1 (SOD1), is crucial for the breakdown of superoxide radicals (O2-) into hydrogen peroxide (H2O2) and oxygen. Many in vitro and in vivo animal investigations have demonstrated the significance of SOD1 in the prevention of cataract formation in the presence of diabetes mellitus.

Acknowledgment

None

Conflict of Interest

None

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