
Developmental Hip Dysplasia and Delayed Walking

Husham A. S. Alkattan

MBChB, DO, MSc*

Abstract:

Background: Most children are able to walk alone by 11 to 15 months but the rate of development is very variable. Some children will fall outside the expected range and yet still be fine in the end. Walking is considered to be delayed if it has not been achieved by 18 months. Delay in walking may be simply variation of normal. Other common causes include, (1) Delay in motor maturation, (2) Abnormalities in muscle tone and power, (3) Environmental factors.

Aim: To determine the Odds' ratio (OR) of the risk factors. To demonstrate differences between cases of DDH and their controls in respect to walking state.

Study design: Case control study in outpatient of Al-Jumhorei teaching hospital. Consisted of 754 (377 cases of DDH, 377 controls), have been examined (295 males and 459 females), ages varies between 12 -208 months average (around 15.06 months)

Study period: 1st Jan 2010-1st Jan 2011.

Methodology: The sample of control was selected according to the method of individual matching, (MacMahon and Pugh, 1970; Gordis, 1996). For each patient with DDH one control was chosen.

Results: Reveals that DDH is not a risk factor for delayed walking, moreover it has been found that it is a protective factor, Odd ratio (**0.293**) with highly significant association , **P <0.002**.

Conclusion: DDH had no effect on delayed walking.

Key word: Developmental hip dysplasia, Delayed walking.

Introduction:

Walking is one of the most universal of all human activities; the detailed components of this act have been studied by relatively few investigators. The mid-nineteenth century studies of the Weber brothers *L'* provided some of the first objective experiments on gait and apparently stimulated lively interest in the study of locomotion⁽¹⁾.

Developmental progression passed in to many stages, pulling to a stand and balancing upright, walking at the end of the first year. Independent walking is typically appears around twelve months but varies widely between individual babies⁽²⁾.

Early identification of children with developmental delays or disabilities can lead to treatment of, or intervention for a disability and lessen its impact on the functioning of the child and family⁽³⁾.

Patient and methods:

The study was conducted through the period 1st Jan 2010-1st Jan 2011 in the outpatient clinic of aljumborei hospital. The target population of this study consisted of 754 patients have been

examined (295 males and 459 females), ages varies between 12 -208 months (average around 15.06 months) for both groups. The age of independent walking for cases ranged from 9 to 18 (average 14.05 months), controls age varies 8-18 (average 14.46 months).

The sample of control was selected according to the method of individual matching, (MacMahon and Pugh⁽⁴⁾; Gordis⁽⁵⁾). For each patient with DDH one control was chosen.

The objectives of cases-control sampling were.

1. To determine the Odds' ratio (OR) of the risk factors.
2. To demonstrate differences between cases of DDH and their controls in respect to state of walking. The criteria for control group selection were: Suffering from any disease other than DDH. Admitted to the same outpatient clinic of the hospital next to the DDH. As far as myself examined the entire cases and controls so that I decided that, those who fail to fulfill the above criteria were excluded.

Data analysis:

Hypothetical scheme of conducting case-control study and calculation of odds ratio, (Mac Mahon and Pugh, Gordis)

		First, select:	
		Cases (With disease)	Controls (Without disease)
Then, measure Past exposure:	Were exposed	A	b
	Were not exposed	C	d
	Total	a+c	b +d
	Odds of exposure	a/c	b/d

The odds ratio is defined as the ratio of the odds that cases were exposed to the odds that the controls were exposed. This is calculated as follows: $\frac{a/c}{b/d}$

Thus, interestingly, $\frac{ad}{bc}$ represents the odds ratio. If the exposure is not related to the disease. The odds ratio will equal 1. If the exposure is positively related to the disease, the odds ratio will be greater than 1 and if the exposure is negatively related to the disease, the odds ratio will be less than 1, Gordis⁽⁵⁾.

The 95% confidence interval (CI) for the odds ratio was calculated using Miettinen's test-based approach, where $95\% \text{ C.I.} = \chi^2 \text{OR}^{(1 \pm 1.96/X)}$ Kirkwood⁽⁶⁾

$\text{OR}^{(1+1.96/X)} = \text{C.I for upper value.}$

$\text{OR}^{(1-1.96/X)} = \text{C.I for lower value.}$

Computer feeding, tabulation and statistical analysis was conducted with personal computer by using windows 2007, Office 2010 (Word, Excel)⁽⁷⁾ Minitab under Windows⁽⁸⁾. Various statistical methods were used to analyze data. Chi-squared (χ^2) test for contingency tables to find the statistical association or difference between cases and controls regarding the presence or absence of risk factors, P-values <0.05 were considered significant. Kirkwood⁽⁶⁾.

Results:

Table 1: This table reveals that DDH is not a risk factor for delayed walking, moreover it has been found that it is a protective factor against delayed walking, Odd (0.293) with highly significant association, $P < 0.002$.

$\chi = \text{the square root of } \chi^2 \text{ value.}$

Table1: The association for cases of DDH and controls, males and females, for delayed walking

Males and Females				
State of Walking	Cases No.	%	Controls No.	%
Not Walked	8	2	26	7
Walked	369	98	351	93
Total	377	100	377	100

$\chi^2 = 9.979$, $DF = 1$, $P < 0.002$
OR=0.293, C.I. (0.133 – 0.643)

Table 2: Shows that there is neither statistical association nor additional risk for DDH in causation of delayed walking. It seems that DDH has no operational effect.

Table2: The association between cases of DDH and controls among males for delayed walking.

Males				
State of Walking	Cases No.	%	Controls No.	%
Not Walked	3	3	11	6
Walked	103	97	178	94
Total	106	100	189	100

$\chi^2 = 1.131$, $DF = 1$, $P < 0.288$ (NS)
OR=0.500, C.I. (0.147 – 1.711)

Table 3: Reveals that developmental hip dysplasia in females had significant effect ($P < 0.002$),

however the Odds ratio(0.217) indicates that it is protective value in females.

Table3: The association among females between cases DDH and controls for delayed walking.

Females				
State of Walking	Cases No.	%	Controls No.	%
Not Walked	5	2%	15	8%
Walked	266	98%	173	92%
Total	271	100%	188	100%

$\chi^2 = 10.021$, $DF = 1$, $P < 0.002$
 $OR = 0.217$, C.I. (0.080 – 0.585)

Discussion:

Normal walking is defined as a highly controlled, coordinated, repetitive series of limb movements whose function is to advance the body safely from place to place with a minimum expenditure of energy⁽⁹⁾. Balance and posture of the body is essential to most human locomotion. The subsystems that make up the postural control system include the following: the sensory system, Visual and proprioceptive systems; the central nervous system, the musculo-skeletal system⁽¹⁰⁾.

Claire⁽¹¹⁾ explained that during walking the optimum speed for energy transfer is lower for a small child than for an adult. While a two-year-old child's optimum speed is about 0.6 m/s, an adult's optimum speed is about 1.6 m/s.

Most children are able to walk alone by 11 to 15 months but the rate of development is very variable (10 months: pulls to standing, 12 months: stands and walks with one hand held, 15 months: walks independently). Some children will fall outside the expected range and yet still be fine in the end. Walking is considered to be delayed if it has not been achieved by 18 months. Most 18-month-olds are proficient walkers. Delay in walking may be simply variation of normal⁽¹²⁻²⁶⁾.

Kamath⁽³⁰⁾ mentioned, late-walking children are often referred to children's orthopedic clinics to exclude developmental dysplasia of the hip (DDH) as the cause of the delay. While the normal age of walking is variable, 97% of British children walk independently by 18.4 months⁽³⁰⁾.

More over delay in walking may be simply variation of normal. Other common causes include: delayed motor maturation, abnormalities in muscle tone and power, environmental factors: these can delay the onset of walking; other: rickets has been reported to delay walking; it is worth noting that obesity and, congenital dislocation of the hip are not causes of delayed walking⁽³¹⁾.

Developmental dysplasia of the hip is an important cause of childhood disability. In the past, without detection by screening, developmental dysplasia of the hip usually presented clinically after walking age⁽²⁷⁻²⁹⁾.

In our study it reveals that **Odd ratio (0.293)** with highly significant association, $P < 0.002$. The same for each sex separately (**OR=0.500**) males, (**OR=0.217**) females respectively. These indicate that DDH is a protective factor. Developmental hip dysplasia not induced delayed walking.

Kamath⁽³⁰⁾ in his study mentioned that even though the median time to the age of independent walking was 1 month less in normal controls compared with that of children with late presentation of DDH, this is clinically insignificant as they all walked before the age of 18 months, and children's with DDH do not present as late walkers.

On the contrary Dunn⁽³²⁾, reported that in an uncontrolled study 22% of children with DDH were still not walking by the age of 18 months. In the (Oxford study (1-2%) of the late walkers had orthopaedic problems). The mean age of starting to walk in this group was 16.5 months (range: 11-28 months) as compared with 13-7 months for the whole population. DDH were still not walking at the age of 18 months. Thus the commonly taught axiom that DDH does not delay the onset of walking is incorrect.

Conclusion

Developmental hip dysplasia act as protective factor, it has no relation for delayed walking.

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* Assistant Professor , Department of Surgery, Mosul Teaching Hospitals and Mosul Medical College, Mosul, Iraq.
E .mail: hishamalkattan@yahoo.com