# Toxoplasmosis in the children who afflicted with congenital deformities and chronic diseases

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**الخلاصه**

داء المقوسات هو مرض يسببه طفيلي وحيد الخلية انتهازي يسمى مقوسة گوندای, المرض يمكن أن يكون خطير جدا وحتى مميت في الأجنة والمواليد الجدد، والاشخاص ذوي المناعة الضعيفة، بالإضافة إلى خطر حدوث مضاعفات الحمل والمشاكل الخلقية.

هدفت الدراسة الحاليه لتحديد العلاقة بين داء المقوسات في الاطفال الذين يعانون من التشوهات الخلقية في مستشفى العلوية للأطفال في محافظة بغداد/ الرصافه للفترة من تشرين الاول لسنة 2012 الى نهاية كانون الثاني لسنة 2013.

جمعت العينات (الدم) من الاطفال في المستشفى المشار اليها واستخدمت تقنيه الامتزاز المناعي (ELISA )لتحديد الكلوبيولين المناعي (IgM) و(IgG) لثمانية وثمانين طفلا يعانون من مختلف التشوهات الخلقية تراوحت اعمارهم بين عمر يوم واحد الى خمس عشرة سنه بالأضافه الى ثمانية وثمانين طفلا اصحاء ظاهريا كمجموعة سيطرة.

أظهرت النتائج ان من بين ثمانية وثمانين طفلا مصاب بالتشوهات الخلقية هنالك 21 (23.86%) نتيجة موجبه لكلوبيولين IgM و 33 (37.50%) نتيجة موجبة لكلوبيولينIgG بينما نسبتي IgM, IgG في مجموعة السيطرة كانتا 3 (3.14%) و 7 (7.95%)على التوالي.

**Abstract**

*Background:*-Toxoplasmosis is an infectious disease caused by unicellular opportunistic parasite called *Toxoplasma gondii.* The disease can be very serious and even fatal in fetuses, newborns, and individuals with weakened immune systems, in addition to the risk of gestation complications and congenital problems.

*Aims of the study:*- The purpose of the present study to determine the relationship between Toxoplasmosis in the children who afflicted with congenital deformities.

*Materials and Methods:*- The eighty eight samples were collected (blood) from the children who afflicted with congenital deformities in Al Alwaiya Children's Hospital and used ELISA technique to determine IgM and IgG Toxoplasmosis, in addition to eighty eight apparently healthy children as a control group.

*Results:*- The results showed that among eighty eight children afflicted with congenital deformities there are 21 (23.86%) positive for IgM and 33 (37.50%) positive for IgG, while the results of IgM and IgG in the control group were 3 (3.14%) and 7 (7.95%) respectively with highly significant variation p=0.001.

*Conclusion:*- The present study showed there is a relationship between the infection by this parasite and congenital deformities. But it cannot be certain Toxoplasmosis is the real cause of congenital deformities in those children, and in the same time it doesn't deny the impact.

## Introduction

Toxoplasmosis is a well documented cause of bad obstetric history and a major reason of congenitally-acquired infection that is caused by parasite *Toxoplasma gondii*, it is an obligate intestinal coccidium, intracellular protozoan parasite, that parasitize a wide variety of avian and mammalian species including human as intermediate hosts and members of *Felidae* family as a definitive host(1) .

At the molecular level, *T.gondii* has ability to form molecular and genetic manipulation, researchers believe that the protozoan parasite, *T. gondii*, is spectacularly successful due to its ability to secrete proteins that allow it to interact with virtually any nucleated host cell during invasion and intracellular survival(2). A key step in protein secretion is the organisms' ability to synthesize and properly target these invasion /maintenance proteins to their respective organelles(3).

In pregnant women Toxoplasma is an important cause of abortion and stillbirth after primary infection, the organism can also cross the placenta and infect the fetus. The symptoms of congenital Toxoplasmosis include abnormal changes in head size (hydrocephaly, microcephaly), intracranial calcification, deafness, damage to the retina and mental retardation(4).

Many studies in the levels of inflammatory cytokines in blood serum of infants with congenital cleft is noted significant increase of TNF-C , IL-1B and IL-4 also these studies showed indicative of more expressing activation of Th2 type cells in infants with congenital cleft(5). Changes in the conditions of infant's immune system with congenital deformities is little studied though it is known that under deformities in infants secondary immunodeficiencies can exist and make those patients susceptible for infectious agents (6).

## Materials and Methods

Samples were collected from eighty eight patients children who afflicted with congenital deformities, aged from 1 day to 15 years who attended in Al Alwaiya Children Teaching Hospital in Baghdad Province. In addition to eighty eight apparently healthy children as control group. This cross sectional study was done during the period from October/ 2012 to the end of January/2013. The blood which collected from children was used to investigate the presence of *Toxoplasma* Abs (IgM, IgG) by using Enzyme Linked Immuno Sorbent Assay (ELISA) technique.

## Results

The positive IgM and IgG Toxoplasmosis in congenital deformities children in table (1) were 21(23.86%), 33(37.50%) respectively while in control group were 3(3.41%) ,7(7.95%) respectively with highly significant variation (HS) for all of them p=0.001.

Table (1):- Distribution of congenital deformities according to IgM and IgG Toxoplasmosis and control group.

| IgM and IgG Toxoplasmosis | | Congenital Deformity | | Control Group | | P. value |
|---|---|---|---|---|---|---|
| | | N0. | % | N0. | % | |
| IgM | -ve | 67 | 76.14 | 85 | 96.59 | P =0.001 H.S. |
| | +ve | 21 | 23.86 | 3 | 3.41 | |
| | Total | 88 | 100.00 | 88 | 100.00 | |
| IgG | -ve | 55 | 62.50 | 81 | 92.05 | P =0.001 H.S. |
| | +ve | 33 | 37.50 | 7 | 7.95 | |
| | Total | 88 | 100.00 | 88 | 100.00 | |

The nervous system deformity ,musculoskeletal deformity ,and other deformities which included in congenital deformities and their results of IgM and IgG Toxoplasmosis demonstrated in table (2),the positive IgM was 8(29.63%) ,9(17.65%) ,4(40.00%) respectively. There was no significant variation (NS) . In the same direction ,the percentage of IgG in those deformities were 21(41.18%), 7(25.93%), and 5(50.00%) respectively without significant variation .

Table (2):- Distribution of congenital deformities according to IgM and IgG

| IgM and IgG Toxoplasmosis | | Congenital Deformities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Nervous system def. | | Musculoskeletal def. | | Others def. | | Total | | |
| | | N0. | % | N0. | % | No | % | N0 | % | P. Value |
| IgM | -ve | 19 | 70.37 | 42 | 82.35 | 6 | 60.00 | 67 | 76.14 | N.S. |
| | +ve | 8 | 29.63 | 9 | 17.65 | 4 | 40.00 | 21 | 23.86 | |
| | Total | 27 | 100.00 | 51 | 100.00 | 10 | 100.00 | 88 | 100.0 | |
| IgG | -ve | 20 | 74.07 | 30 | 58.82 | 5 | 50.00 | 55 | 62.50 | N.S. |
| | +ve | 7 | 25.93 | 21 | 41.18 | 5 | 50.00 | 33 | 37.50 | |
| | Total | 27 | 100.00 | 51 | 100.00 | 10 | 100.00 | 88 | 100.00 | |

According to the table (4-3) The positive IgM in age groups (≤ 5), (6-10), and (11-15) was 14(25.45%) ,6(24.00%), 1(12.50%) respectively , with no significant variation.The higher result of IgG was in age group (≤5) year and it was 23(41.82%), while in age group (6-10) year was9(36.00%) , and in (11-15) year was 1(12.50%) , with no significant variation .

Table (3):-Distribution of congenital deformities IgM and IgG Toxoplasmosis according to the age Groups / year.

| IgM and IgG Toxoplasmosis | | Age Groups /year of Congenital Deformities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ≤ 5 | | 6-10 | | 11-15 | | Total | | p. value |
| | | N0 | % | N0 | % | N0 | % | N0 | % | |
| IgM | -ve | 41 | 74.55 | 19 | 76.00 | 7 | 87.50 | 67 | 76.14 | N.S. |
| | +ve | 14 | 25.45 | 6 | 24.00 | 1 | 12.50 | 21 | 23.86 | |
| | Total | 55 | 100.00 | 25 | 100.00 | 8 | 100.00 | 88 | 100.00 | |
| IgG | -ve | 32 | 58.18 | 16 | 64.00 | 7 | 87.50 | 55 | 62.50 | N.S. |
| | +ve | 23 | 41.82 | 9 | 36.00 | 1 | 12.50 | 33 | 37.50 | |
| | Total | 55 | 100.00 | 25 | 100.00 | 8 | 100.00 | 88 | 100.00 | |
| Mean± SD | | 2.97±3.92 | | | | | | | | |

The results of Toxoplasmosis IgM, IgG in children with congenital deformities and distribution it with gender represented in table (4-4). The high percentage of IgM was in females 20(52.38%) while in males there was only one 1(2.17%) of them was infected, there was high significant variation p=0.001. In the same side, the positive IgG in males and females was 17(36.96%). 16(38.09%) respectively with no significant variation.

Table (4):- Distribution of congenital deformities IgM and IgG Toxoplasmosis according to the gender.

| Gender of Congenital deformities | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IgM &IgG | | Males | | Females | | Total | | P.value |
| IgM | | No. | % | No. | % | No. | % | |
| | -ve | 45 | 97.82 | 22 | 52.38 | 67 | 76.13 | P=0.001 H.S |
| | +ve | 1 | 2.17 | 20 | 47.19 | 21 | 23.86 | |
| | Total | 46 | 100.00 | 42 | 100.00 | 88 | 100.00 | |
| IgG | -ve | 29 | 63.04 | 26 | 61.91 | 55 | 62.50 | N.S. |
| | +ve | 17 | 36.96 | 16 | 38.09 | 33 | 37.50 | |
| | Total | 46 | 100.00 | 42 | 100.00 | 88 | 100.00 | |

History of maternal abortion and contact with cats in congenital deformities children and their results of IgM Toxoplasmosis were explained in table (5), the positive IgM was18(85.71%) in children who their mothers with history of abortion, while there was only 3(14.29%) positive IgM but without history of abortion with significant variation. In the same table, the positive IgM was 20(95.24%) in children had history of contact with cats in their houses. While there was only 1(4.76%) positive IgM but had never contact. There was highly significant variation p=0.003.

Table(5):-Distribution of IgM Toxoplasmosis in congenital deformities according to history of maternal abortion and contact with cats.

| Abortion/ Contact with Cat | | Congenital Deformities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IgM Toxoplasmosis | | | | | | |
| | | Negative | | Positive | | Total | | |
| | | N0 | % | N0 | % | N0 | % | P. Value |
| Maternal Abortion | No | 28 | 41.79 | 3 | 14.29 | 31 | 35.23 | P = 0.021 S. |
| | Yes | 39 | 58.21 | 18 | 85.71 | 57 | 64.77 | |
| | Total | 67 | 100.00 | 21 | 100.00 | 88 | 100.00 | |
| Contact with Cat | No | 26 | 38.81 | 1 | 4.76 | 27 | 30.68 | P = 0.003 H.S. |
| | Yes | 41 | 61.19 | 20 | 95.24 | 61 | 69.32 | |
| | Total | 67 | 100.00 | 21 | 100.00 | 88 | 100.00 | |

Table (6) explained the relationship between results of IgG in congenital deformities children with history of maternal abortion and contact with cats, the results showed the percentage of positive IgG was 30(90.91%) in children who had mothers with history of abortion, while there was only 3(9.09%)positive IgG from them but without history of abortion, with high significant variation p=0.001.

In the same way, the positive IgG was 29(87.88%) in children had contact with cat in their houses, and 4(12.12%) positive IgG but had never contact with high significant p=0.003.

Table(6):- Distribution of IgG Toxoplasmosis in congenital deformities according to history of maternal abortion and contact with cats.

| Abortion/ Contact with Cat | | Congenital Deformity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IgG Toxoplasmosis | | | | | | |
| | | Negative | | Positive | | Total | | p. value |
| | | N0 | % | N0 | % | N0 | % | |
| Maternal abortion | No | 28 | 50.91 | 3 | 9.09 | 31 | 35.23 | P= 0.001H.S. |
| | Yes | 27 | 49.09 | 30 | 90.91 | 57 | 64.77 | |
| | Total | 55 | 100.00 | 33 | 100.00 | 88 | 100.00 | |
| Contact with cat | No | 23 | 41.82 | 4 | 12.12 | 27 | 30.68 | P = 0.003H.S. |
| | Yes | 32 | 58.18 | 29 | 87.88 | 61 | 69.32 | |
| | Total | 55 | 100.00 | 33 | 100.00 | 88 | 100.00 | |

## Discussion

The current study has given important results to determine the relationship between the infection with Toxoplasmosis and affliction with congenital deformities.

The results in table (1) are agree with the study in Saudi Arabia(1994)(7) which revealed that positive IgM were (23.1%) and IgG ranging from (32.1%)by (IHAT) and 46.2% by (ELISA) in premature infants with different clinical pictures, also there is disagreement with research in united states (2011)(8), when it revealed the positive IgM Toxoplasmosis were (77.4%) in infant with congenital deformities, this different may be due to the variations in ages of patients, numbers of samples and environmental conditions beside the variation in awareness in dealing with cats .

The nervous system deformities included hydrocephalus and microcephalus patients and their results of IgM and IgG in the table (4-2), these results are disagree with study in Iraq(2009)(9) in one hundred and forty newborns when it is revealed Toxoplasmosis in hydrocephalus and abnormal size of children's heads were (12%), there is another disagreement with study in united states (2011)(8) it revealed the positive IgM Toxoplasmosis in hydrocephalus infants were (86.6%). These differences may be due to the variations in ages of patients besides the effect of care level for pregnant women and the differences in socioeconomic status, beside the chances to direct contact with cats. Musculoskeletal deformities cases included face, mouth, and limbs deformities, and their results of IgM and IgG Toxoplasmosis are demonstrated in the same table. According to the researches which available there is no study addressed to clarify the relationship between musculoskeletal deformities and Toxoplasmosis. But the belief the relationship between Toxoplasmosis and this kind of deformities lies through that *T. gondii* has ability to form molecular and genetic manipulation(2,10).

About other deformities in table (2), which include (congenital blindness and chorioritinitis children), the present results are agree with researches in Netherlands (2002) (11), in Nepal (2003) (12) and in Yemen (2009)(13).

While there is a disagreement with study in Mexico (2010) (14), when it found the positive Toxoplasmosis in visual impairment adults were (12%), also there is another disagreement with study in united states (2011)(8), when it revealed the positive IgM in infant with eyes problems were (85.7%). The differences may be due to the level of pollution, direct contact with infected cats by oocyst and the variations of environmental conditions.

The results which are present in table (3) disagree with study in Yemen (2009)(13), which revealed the positive Toxoplasmosis in congenital deformities increase in age group (10-14) year, the reason for this difference may be due to the variation in the duration of samples collection beside the numbers of samples.

The table (4), explained the distribution of positive IgM and IgG Toxoplasmosis in congenital deformities children according to the gender, these results in agreement with studies in Yemen (2009)(13) and in united state (2005)(15), all these results showed the rate of infection were higher in females more than males, the reason for this is possible that due to the differences in the physiological nature between females and males which may be make the females more susceptibility to the infection.

About the table (5), the results of IgM Toxoplasmosis are agree with study in Iraq (2009) (9) which showed there is a relationship between the infection with Toxoplasmosis in congenital deformities children and maternal abortion, while about the relationship between the positive IgM Toxoplasmosis and contact with cats, the present results are agree with the study in Brazil (2003)(16), when they found the positive IgM Toxoplasmosis increased in congenital deformities children within the direct contact with cats.

The results in table (6) are agree with study in Iraq (2009) (9), when it showed there is a relationship between IgG Toxoplasmosis in congenital deformities and the maternal abortion. Also the present results are agree with the study in Brazil (2003) (16) when they found the positive IgG Toxoplasmosis increased in different congenital deformities children within the direct contact with cats.

## Conclusion

The current study showed that from total eighty eight children afflicted with congenital deformities that the positive results from IgM and IgG Toxoplasmosis were 21(23.86%) and 33(37.50%) respectively, with highly significant variation as a compare with control group. Also the results identified that there is a relationship between positive Toxoplasmosis and maternal abortion beside contact with cats in those children. The present study cannot be certain Toxoplasmosis is the real cause of congenital deformities in these children, but at the same time it doesn't deny the impact.

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