

The frequency of enteric fever among children in Al-Nasseriah city/Iraq and their relation to the zinc and copper levels

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Summary

Enteric fever is characterized by severe systemic illness. The leading cause of the syndrome of enteric fever is *Salmonella enterica* serotype Typhi (in the past *S. Typhi*). Other *Salmonella* serovars, chiefly *S. enterica* serotype paratyphi A, B, or C, can be a source of comparable syndrome. The aim of this study is detects the occurrence of enteric fever among children in Thi-Qar province and detect the zinc and cooper levels in their serum and their relative to infection. The total of (327) blood specimens collected from children suspected anguish from enteric fever and (35) children as control group, the identification of the disease was depending on clinical signs and using immune chromatography kits. While, the trace elements levels was detected by commercial

kits. The results shown that the illness was detected in 50 (15.29%)of children, the number of infected males was 28 (56.0%). While female 22 (44%) from infected children with no significant differences under ($P < 0.05$). The zinc level of infected child was (136.2 ± 46.99 std.) $\mu\text{g/dl}$ in compared with control group (120.04 ± 21.20) $\mu\text{g/dl}$. The copper levels was (117.88 ± 19.12) $\mu\text{g/dl}$ and in control group was (111.85 ± 27.09) $\mu\text{g/dl}$ and the results were not significant under ($P < 0.05$) between infected and control groups. In brief, the rate of enteric fever was high among children under this study and there is no significant differences among children gender and trace elements levels with infection under study.

Key words: Enteric fever, Salmonellosis, Trace elements.

Introduction

Enteric fever continue to be a global health problem, especially in tropic and sub tropic area with an annual global burden of about 21,600,000 illness and 220,000 death during 2000 and that paratyphoid cause 5,410,000 illness. this infection triggered by the bacterium called *Salmonella enterica*. Enteric fever is a firmly human disease and the organism transmitted by oral route through the ingestion of contaminated foods, Carriers are an important source of infection especially in food handling settings^(1,2).

Salmonella enterica sub spp. enterica serovar typhi (formerly *Salmonella typhi*) a gram-negative bacilli is wide spread in nature present in a diverse hosts such as birds, the organism is a causal agent of enteric fever and the disease spread in warm climate area, poor sanitation and unappropriated food handling is an important factors in occurrence of infections^(3,4). The clinical appearance of enteric illness diverges from a minor infection with mild fever, malaise, and slim cough to a harsh clinical cases with abdominal discomfort and multiple complications such as intestinal hemorrhage and perforation, and the rate demise cases was 10–15%.^(3,5).

The immune response to enteric fever is include antibody mediated and cellular branches. In nonfatal cases, humoral antibody and activated macrophages eventually subdue the untreated infection over a period of about 3 weeks. Reinfection is rare unless the course was shortened by early administration of anti-

microbe. Which antigens stimulate this immunity is not clearly understood^(1,6). The resistance to disease is related to antibodies produced against O and Vi. But, these antibodies not prevent the relapses which may occur in 2–3 weeks after recovery⁽³⁾.

Zinc is existing in all portions of the body with a several functions. It supports the wounds healing and its enter in the structure of many enzymes. Healthy skin, immune system and resistance to infection is depending on zinc concentration⁽⁷⁾. Zinc is known to has a pivotal role in the immunity, and the persons with deficiency in zinc are augmented susceptibility to infectious agents. the numerous features of the immunity are affects by zinc from the skin to action of lymphocytes. Also, zinc is crucial for normal development and function of neutrophils and natural killer cells that associated with innate immunity^(8,9).

Copper is a mineral that is involved in many critical functions such as: hematopoiesis, respiration, hormone and antioxidant activities, zinc inhibits absorption of copper and vice versa, the relationship has been established between copper and the normal function of the immune system .Cytochrome c oxidase contain copper is needed for energy creation of immune cells, superoxide dismutase help in the protection of immune cells against reactive oxygen species Moderate and even marginal copper deficiency affects some activities of T-lymphocytes and phagocytic cells adversely^(10,11,12).

The aim of this study is detection of the enteric fever occurrence among children in Thi-

Qar province and detect the zinc and cooper levels in the serum and its relative to infection.

Materials and methods

Specimen collection

The study was performed during the period from October /2014 to February /2015 in Bent Al-Huda teaching hospital. A three hundred twenty seven serum specimens from the child suspected sorrow from enteric fever depending

on their clinical signs that determine by physician were collects, the specimens including (180) males and (147) females with the age from (9) months to (14) years. Control group involves 35 child include 21 males and 14 females with the age range from (11 months to 15 years).

Determination of infections

The commercial kit provided by (CTK-USA) was used to detect enteric infections as illustrated by test kit index.

Trace elements

The concentrations of zinc and copper was detected in serum of both groups according to the instruction provided by manufacturer (Spectrum-Egypt) by using spectrophotometer (Apel-Japan).

Statistical analysis

The (SPSS) program (version 19) used for statistical analysis by Chi square and ANOVA tests.

Results

The frequency of enteric fever among children was 50 (15.29%) from 327 child under this study as shown in table (1).

Table (1): The occurrence of enteric among children

Infection	No.	Percent
Positive	50	15.29
Negative	277	84.71
Total	327	100

The results was not significant between males and females in the occurrence of enteric fever under ($P < 0.05$). The infected males were 28 (56%) and females 22 represents (44 %) of infected cases as illustrated in table (2).

Table (2): Dissemination of enteric fever depending on the gender.

Gender	Infections		Total
	Positive	Negative	
Male	28	152	180
	56.0%	54.9%	55.0%
Female	22	125	147
	44.0%	45.1%	45.0%
Total	50	277	327
	100.0%	100.0%	100.0%

The zinc level of infected child was (136.2 ± 46.99 std.) $\mu\text{g/dl}$, in control group the level was (120.04 ± 21.20) $\mu\text{g/dl}$ and the differences was insignificant between these groups. Also, the study shown no significant differences in the copper levels for the previous groups under ($P < 0.05$). Where the mean of copper level of infected group was (117.88 ± 19.12) $\mu\text{g/dl}$ and in control group was (111.85 ± 27.09) $\mu\text{g/dl}$ as shown in table (3).

Table (3): Zinc and copper levels among infected children and control group.

Trace elements	Groups	Number	Mean	\pm std.
Zinc ($\mu\text{g/dl}$)	Infection	50	136.20	46.992
	Control	35	120.04	21.207
Copper ($\mu\text{g/dl}$)	Infection	50	117.88	19.125
	Control	35	111.85	27.098

Discussion

Typhoid fever is a universal infection initiated by *Salmonella enterica* serotype Typhi (*S. typhi*). In developing countries, the illness considered as a vital health care problem. In 2000, over 2.16 million cases of typhoid fever was recorded worldwide, lead to 216000 deaths and about 90% of this cases happened in Asia. Although better water superiority and sanitation create vital solutions of the problem, immunization in endemic areas is the active control approach recommended by WHO for the short-to-intermediate term. In children the age group 5–15 years has highest rate of infections. However, in areas with highly endemic occurrence, children <5 years of age may have the highest infection rates , the results were comparable to previous studies that exhibited high proportion of enteric fever which occur due to increase the carriers in the community, poor sanitation, contamination of water by the sewage that leakage to water supply, failure of chlorination^(1,13,14).

Conclusion

The study shown high frequency of enteric fever in the children under study and there is no relation between gender of child and occurrence of enteric fever. Also, the levels of zinc and copper were not affect the occurrence of infection in children under study.

According to the data, there is no relation between the occurrence of enteric fever and gender of children under this study, which is not acceptable to some studies that indicate that the male children were more susceptible to infection than female , this differences may be due to ethnic differences and the types of tests that used in diagnosis of enteric fever where some of these studies used blood culture for diagnosis, socio-economic conditions play an important roles in development of enteric fever^(15,16).

The levels of trace elements (zinc and copper) have no significant differences between infected and control group , this may be because the presence of the same nutritional programs in our population, even though ,the level of zinc was more than the normal value that provided with test kit index which may due to the differences between communities in socio-economic state, types of food consuming & ethnic features^(7,10,12,15).

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