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# NITRATE AND NITRITE CONTENT IN DRINKING WATER AND BABY FOODS IN EGYPT AND THEIR EFFECT ON THE PUBLIC HEALTH

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## ABSTRACT

The present study aimed to study the nitrate and nitrite contents of drinking water and baby foods in Egypt and their effect on the health. Drinking water samples were collected from 3 governorates in Egypt during the year 2001 and the nitrate and nitrite contents were estimated. Samples of fresh vegetables (potatoes, carrots and squash) were collected and blanched and prepared as baby foods. Samples of fresh fruits (apple, banana, guava and orange) were collected and juices of guava and orange were prepared. Belila, boiled rice, Foul medames and lentil were prepared Baby foods samples were purchased from local market in Egypt including Cerelac, Gerber, RiRi, Galactina, phosphatin and carrot and the nitrate and nitrite contents were estimated in the previously cited foods.

The **results can be summarized in the following points:-**

1-a Drinking water samples in Giza governorate contain great amount of nitrate especially Al Haram, Fessal and Al Saf, the values ranged in between 27-69, 22-42 and 23-45 mg $NO_3$ / L, respectively, areas contain low level of nitrate content such as Imbaba and Al Badrashin, the values ranged from 0.1-0.7 and 0.1 –5 mg $NO_3$/ L, respectively, while the nitrite content showed 0.0 –1.3, 0.0 – 1.1, 0.0 –1.3, 0.0 – 0.0 and 0.0 – 0.2 mg/kg, respectively. The high nitrate and nitrite contents suggested that sources of drinking water are mostly ground water.

b- Cairo and Kaliobia governorates have low level of nitrate and nitrite and/or free of nitrite, the highest value of nitrate in Cairo governorate was 0.1- 1.5 mg/ L, and in Kaliobia governorate was 0.1 – 10 mg / L.

2- The content of nitrate and nitrite in some baby foods:

a- The blanched vegetables (potatoes, carrots and squash) contain 43- 95, 54-97 and 14- 78 mg nitrate / kg , respectively, whereas the nitrite content was 0.0 – 0.5. 0.0-3.4 and 0.0 – 0.4 mg nitrite/ kg , respectively.

b-The fresh fruit (apple, guava juice, banana and orange juice have nitrate value of 10-22, 15-26, 7-16 and 18-29 mg $NO_3$ / kg, respectively, whereas the previously mentioned fruits have no nitrite.

c- Belila and boiled rice have nitrate value of 13-24 and 15 – 29 mg $No_3$ / kg, respectively, whereas they have no nitrite.

d- Foul Medames and boiled lentil have nitrate value of 35 – 42 and 19 – 28 mg $NO_3$ / Kg, respectively, while they are free of nitrite.

3-The nitrate and nitrite contents of some ready baby foods:

a- Samples of rice – carrot, carrot and vegetables have high levels of nitrate and nitrite ranging 63.8 , 56, 43.32 mg $NO_3$ / kg, 2.65, 2.3 and 2.15 mg $NO_2$ / kg

b- Samples of rice, wheat, 5 fruits, wheat milk, meat extract – vegetable, protein and chicken soup have middle values of nitrate ranging 16.75, 11 17,7,97, 22.34,10 42,13.9 and 9.24 mg / kg, respectively, while the nitrite content was 0.238, 0.24, 0.65, 1.23, 1.32, 1 24 and 1.88 mg $NO_2$ /kg.

c-Samples of 3 fruits ,orange – apple and flakes have low level of nitrate ranging 4.3, 0.23 and 0.58 mg/ kg , respectively, while the nitrite content was 0 5 mg

$NO_2$/ kg for flakes and the samples of 3 fruits and orange – apple were free of nitrite

4- It is clear from the results of this study that the majority of baby foods prepared in the house and that already purchased from local markets and drinking water supplied to the child at the beginning of the fourth month in order to provide their food requirements have amounts of nitrate or nitrite or both of them.

## INTRODUCTION

Nitrate is essentially non- toxic to mammals, but it can be reduced to nitrite either in improperly stored food, in the gastrointestinal tract of the infants and by the microflora of the human mounth. The nitrite from these and other sources, including that purposely added to food, presents a toxic hazard both because of the direct toxicity of nitrite, and by the formation of carcinogenic N- nitroso compounds by reaction with amino compounds.

USEPA'S (1990) currently has a guideline for in drinking water that is the same as the World Health Organization (WHO,1972) Standard (10 mg $NO_3$ / N / L) or (45 mg $NO_3$/L).

Nitrate concentration in surface water are usually bellow 5 mg N/L $NO_3$ (22 mg $NO_3$/L) and much higher concentration are sometimes found in ground water (Freser and Chilvers 1981). For example, a survey of 2000 wells showed that 31.6% of wells examined contained more than 20 mg N/L $NO_3$ (88.5mg / L $NO_3$) (WHO, 1972).

Many studies indicated that nitrogen from synthetic fertilizers was the most important nitrate and nitrite sources in ground water contamination.

Infants who fed water or baby foods made with water that is high in nitrate can develop a condition that doctors call methemoglobinemia. The condition is also called " blue baby syndrome" because the skin appears blue – gray or lavender in color. This color change is caused by a lack of oxygen in the blood.

All infants under six months of age are at risk of nitrate poisoning. Some babies may be more sensitive than others.

Infants suffering from "blue baby syndrome" need immediate medical care because the condition can lead to coma and death if it is not treated promptly.

When nursing mothers ingest water that contains nitrate, the amount of nitrate in breast milk may increase. Nitrite ion is the form implicated in toxicity to humans, and since infants are at far greater risk of methemoglobinemia than adults, virtually all of the nitrite data that are available are for prepared baby foods. (Achtzehn and Hawat, 1969; and National Research Council, 1972).

According to the recommendation of WHO (1974) baby food should not contain any nitrate or nitrite and it was found that the addition of vitamin C provide protection against the formation of methaemoglobine(Shuval and Gruener 1972).

Vitamin C taken orally in doses of up to 500 mg daily is usually sufficient to maintain the level of methemoglobin below 10% (Bancroft 1948) also vitamin C reduces methemoglobin and is the preferred treatment for these cases in a dosage of 200 to 1000 mg orally daily (*Kaplan and Chirouze* 1978, Curry 1982).

*Vitamin* C plays a major role as an antioxidant and blocks the formation of nitrosamines (Ohshima and Bratsh, 1981) because the vitamin C- nitrite reaction is more rapid than the amine – nitrite reaction (Tannenbaum *et al.*, 1991) because the vitamin reduces *nitrite, being oxidized* to dehydroascorbic acid in the process, thereby inhibiting the reaction of nitrite with amines

$$2HNO_2 + ASC \longrightarrow 2NO + \text{Dehydro asc} + 2Ho$$

The objectives of this study were to determine nitrate and nitrite content in drinking water and baby foods in Egypt and the effect on the health.

## MATERIALS AND METHODS

**B-Sampling**

*Drinking water, fresh* vegetables, fruits, cereals, legumes and ready baby foods. Samples were collected from 3 governorates (Giza, Cairo and Kaliobia) during the year 2001.

**B- Drinking water**

*Samples of drinking* water were collected weekly from 5 different locations of 3 governorates (Giza, Cairo and Kaliobia)all over the year 2001 (720 samples) were analyzed for nitrate and nitrite.

**B- Foods used for feeding infants**

**Ш .1 Vegetables and fruits**

Fresh vegetables and fruits samples of *potatoes, carrots, squash*, apple, guava, banana and orange of 1 kg were collected from 5 different *locations of each* studied governorates during the months of their production (15 composite samples each).

**Ш .2 Cereals and Legumes**

Composite samples of wheat, rice, *bean and lentil of 1 kg were* collected from 5 different locations of each studied governorates (15 composite samples each)

**Ш .3 Ready baby food samples**

Samples were collected from markets and pharmacy. Ten tins from each product (Cerelac, *Riri , Galactia, Phosphatin, Gerber and Carrot) were* and analyzed for nitrate and nitrite.

***B- Preparation of samples***

**IV.1 Preparation of vegetable samples**

100 g from potatoes ,carrots and squash were boiled for 30 min(except squash which was boiled for 15 min) in 500 ml deionized water and analyzed for nitrate and nitrite.

***IV.2 Preparation of fruit samples***

Fresh fruit samples of apple, guava, banana and orange were cleaned to get rid of any dust and washed by spraying with deionized water, blanched, guava juice was prepared with 250 g of guava fruits (Seeds were discarded ) were blended with 50 g sugar and 1000 ml deionized water, orange juice prepared with 500 ml orange extract, 50 g sugar and 500ml deionized water were added and analyzed for nitrate and nitrite.

**IV.3 Preparation of cereals and legumes**

**IV.3.1 Cooked wheat (Belila)**

100 g of wheat grain were washed with deionized water and soaked for 24 hr in 200 ml deionized water, brought to boiling and continued boiling for 1 hr, with continuous addition of deionized water to have a final added volume of 1200 ml. The resulted product, 780 g, is called in Egypt "Belila" and analyzed for nitrate and nitrite.

**IV.3.2 Boiled Rice**

100 g of polished rice were washed with deionized water and boiled in a volume of deionized water for 1 hr with continuous addition of deionized water to a final added volume of 1000 ml. The final product weight was 550 g and analyzed for nitrate and nitrite

**IV.3.3 Bekans (Foul medames)**

100 g of faba beans were washed with deionized water, brought to boiling using 700 ml of deionized water, then stewed for 4 hrs, to produce what is known in Egypt as "foul medames" .The skin of bean was discarded. The production was 460 g and analyzed for nitrate and nitrite

**IV.3.4 Lentil**

Lentil was prepared in the same way as beans. The final product weight was 460 g and analyzed for nitrate and nitrite.

**B- Determination of nitrate and nitrite**

**V.1 Determination of nitrate and nitrite in ready baby foods, fresh vegetables, fruits, cereals, legumes and water samples.**

Ready baby foods, fresh vegetables, fruits, cereals legumes and water samples were determined according to the method of SEN and Donaldson (1978) using sulfanilic acid and N-(1-Naphthyl) ethylenediamine dihydrochloride and reading the absorbance at 550 nm.

## RESULTS AND DISCUSSION

**1- Nitrate and nitrite in drinking water**

Table (1) presents the results of nitrate and nitrite contents in drinking water allover the year 2001 from 3 governorates.

In the investigation of the nitrate and nitrite contents of drinking water in Giza, Cairo and Kaliobia, the expected high values found in some regions especially for nitrates suggested that sources of drinking water in these areas are mostly ground water, As shown in Table(1) , Al Haram has the highest values for nitrate and nitrite in drinking water(27 – 69 mg $NO_3$ /L and 0.0 – 1.3 mg $NO_2$ /L), respectively, followed by Fessal, while the other areas in Giza , Cairo and Kaliobia have nitrate and nitrite value in the safe limit.

The *nitrate value is in excess of* the WHO (1978) guide line value of 10 mg $NO_3$ – N/L ~ 45 mg $NO_3$ /L. The high nitrate and nitrite contents are supposed to be due to the nitrate and nitrite leaching from agricultural soils in this area. In agreement with our finding, it was shown that *agricultural* activities may result in nitrate leaching with concentrations approaching 50 mg / L or even *higher (ECETOC 1988).*

The main sources of nitrate leaching are the nitrate released from soil organic matter in bare land and nitrogen fertilizer and organic manure applied at levels beyond the capacity of soil and crop to utilize the nitrogen . *Croll* (1990) who showed that nitrate concentrations in U.K. waters are rising in Southern *and Eastern England, where* intensification of agriculture has increased nitrate leaching from soils to both surface and ground water. No widespread deterioration due to nitrate has bean observed in rivers or lakes. Johnson and Kross (1990) concluded that the contamination of ground water and rural drinking water supplies by nitrates from livestock and human excrement, *other organic wastes, or chemical* fertilizers is a potential hazard throughout the world.

Infant illness and death from nitrate induced methemoglobinemia is probably often misdiagnosed. Infant death resulting from misdiagnosis of this intoxication still occurring as recently as 1986. They showed that groundwater concentrations *of nitrate were mostly unsafe for* consumption and that standards are needed to regulate such contamination. They also indicated that the constructed wells more than 30 meter deep are more likely to be safe.

Exposure to nitrite is important in any discussion of health effects of nitrate because *nitrate itself is not toxic. Potential health* consequences enter the picture only when nitrate is reduced to nitrite. Nitrite is formed from nitrate or ammonium ion by certain micro – organism in soil, water, sewage and alimentary tract, thus, the concern with nitrate in the environment relates to its conversion by biological systems to nitrite (Ten Brink *et al* 1982)

Table(1) **Nitrate and nitrite content in drinking water allover the year 2001 from 3 governorates.**

| Location | Area | Number of samples | $NO_3$ mg/ L | $NO_2$ mg/ L |
|---|---|---|---|---|
| Giza | AL- Haram | 240 | 27-69 | 0.0-1.3 |
| | Fessal | | 22-42 | 0.0-1.1 |
| | Imbaba | | 0.1-0.7 | 0.0-0.0 |
| | AL-Badrashin | | 0.1-5 | 0.0-0.02 |
| | AL- Saf | | 2.3-45 | 0.0-1.3 |
| Cairo | AL-Maadi | 240 | 0.1-0.7 | 0.0-0.0 |
| | *Shoubra* | | 0.1-1.0 | 0.0-0.0 |
| | Helwan | | 0.1-1.5 | 0.0-0.001 |
| | Nasr-city | | 0.01-0.1 | 0.0-0.0 |
| | AL-Amyria | | 0.1-0.7 | 0.0-0.0 |
| Kaliobia | AL_Kanatter | 240 | 0.1-0.5 | 0.0-0.0 |
| | Toukh | | 0.1-1.3 | 0.0-0.001 |
| | Banha | | 1.5-10 | 0.0-0.01 |
| | Shoubra EL-Khema | | 1.8-10 | 0.0-0.01 |
| | Kalioub | | 0.7-1.5 | 0.0-0..001 |

**1- Nitrate and Nitrite of some baby foods**

Nitrate and nitrite were estimated in some baby foods (cooked vegetables, fresh fruits, cereals and legumes) and recorded in table(2). Nitrate levels in potatoes, carrots and squash are (43 - 95, 54 - 57, 14 -78 mg/kg, respectively). While nitrite levels reported are (0.0 – 0.5, 0.0 – 3.4 and 0.0 – 4.0 mg / kg, respectively).

The occurrence of nitrate in food may be considered hazardous because nitrate can be readily reduced microbially to nitrite which interacts with haemoglobin to affect the oxygen transport mechanism giving rise to a condition known as methaemoglobinemia (WHO, 1977). Infants under 3 months old are thought to be more vulnerable than adults to this particular toxic effect of nitrate.

Whereas nitrate contents of fresh fruit, cereals and legumes are generally low and of the order of 7 – 42 mg / kg. Whilst nitrite is virtually absent according to reviews by White (1975).

Nitrate levels in fresh fruits (apple, guava, banana and orange are (10-22, 15 – 26, 7-16 and 18-29 mg/kg, respectively, while cereals (Belila)), and boiled rice are (13 – 24 and 15 – 29 mg /kg, respectively). And legumes (bekans (foul medams) and lentil) are 35 – 42 and 19 – 28 mg / kg, respectively. Nitrite levels reported for the 3 categories are 0.0 mg / kg . Thus, it would appear that the contribution of fruit to the human intake of nitrate is small whilst that of the nitrite is negligible.

**Table (2) Nitrate and nitrite content of some foods during the year 2001 from 3 governorates**

| Type of food | $NO_3$ mg/kg | $NO_2$ mg /kg |
|---|---|---|
| **Cooked vegetables** | | |
| Potatoes | 43-95 | 0.0-0.5 |
| Carrots | 54-97 | 0.0-3.4 |
| Squash | 14-78 | 0.0-0.4 |
| **Fresh Fruits** | | |
| Apple | 10-22 | 0.0-0.0 |
| Guava | 15-26 | 0.0-0.0 |
| Banana | 7-16 | 0.0-0.0 |
| Orange | 18-29 | 0.0-0.0 |
| **Cereals (Belila)** | 13-24 | 0.0-0.0 |
| Boiled Rice | 15-29 | 0.0-0.0 |
| **Legumes** | | |
| Bekans (foul medams) | 35-42 | 0.0-0.0 |
| Lentil | 19-28 | 0.0-0.0 |

**Nitrate and Nitrite of some ready baby foods**

Table (3) presents the results of nitrate and nitrite content of some market baby foods. Considerable variation in nitrate concentrations was found with concentrations ranging from 0.23 mg/ kg (Orange – Apple) to 63.8 mg / Kg (Rice – Carrots).

As shown in Table (3), different baby foods products were purchased from supermarkets and pharmacy including Cerelac, Riri , Galactina, Phosphatin and Gerber.

**1- Cerelac**

Wheat, rice and wheat milk have nitrate values of 11.7, 16.75 and 22 34 mg/kg, respectively, while nitrite values are 0.24, 0.238 and 1.23 mg/ Kg. respectively.

**2- RiRi**

Vegetable, Mixed fruit, protein and flakes have nitrate values of 34.32, 6.74, 13.9 and 4.9 mg / kg, respectively, while nitrite values are 2.15, 0.13, 1.24 and 0.58 mg/kg, respectively.

**3- Galactina**

Rice, 5-cereal and 3-fruit have nitrate values of 11.76, 7.97 and 4.3 mg/kg, respectively, while nitrite values are 0.22, 0.65 and 1.21 mg/ kg, respectively.

**4- Phosphatin**

Rice carrots and 5- cereal have nitrate values of 63.8 and 9 7 mg/kg, respectively, while nitrite values are 2.65 and 0.63 mg/kg, respectively.

**Table(3): Nitrate and nitrite content of some ready baby foods**

| Type of baby food | $NO_3$ mg / kg | $NO_2$ mg / kg |
|---|---|---|
| **Cerelac** | | |
| -Wheat | 11.17 | 0.24 |
| -Rice | 16,75 | 0.238 |
| -Wheat milk | 22.34 | 1.23 |
| **RiRi** | | |
| -Vegetable | 34.32 | 2.15 |
| -Mixed fruit | 6.74 | 0.13 |
| -Protein | 13.9 | 1.24 |
| -Flakes | 4.9 | 0.65 |
| **Galactina** | | |
| Rice | 11.76 | 0.22 |
| 5-cereal | 7.97 | 0.05 |
| 3-fruit | 4.3 | 0.0 |
| **Phosphatin** | | |
| Rice carrots | 63.8 | 2.65 |
| 5- cereal | 9.7 | 0.63 |
| **Gerber** | | |
| -Wheat milk | 16.92 | 0.24 |
| -Meat extract – vegetable | 10.42 | 1.32 |
| -Chicken – soup | 9.24 | 1.88 |
| -Orange – apple | 0.23 | 0.0 |
| **Carrot** | 56 | 2.3 |

**5- Gerber**

Wheat milk, meat extract – vegetable, chicken – soup and organge – apple have nitrate values of 16.92, 10.42, 9.24 and 0.23 mg/kg, respectively, while nitrite values are 0.24, 1.32, 1.88 and 0.0 mg/ kg, respectively.

5- **Carrot**

Carrot has nitrate value 56 mg/kg while nitrite value has 2-3 mg /kg.

According to the WHO (1974) baby food should not contain any nitrate or nitrite. Twelve cases of methemoglobinemia were recorded by Centa *et al* (1985) to be due to formula made from nitrate and nitrite contaminated water or carrots Methemoglobinemia is a condition resulting from conversion of hemoglobin, the oxygen carrier of mammalian blood, to methemogloglobin which is unable to transport oxygen. Several chemicals such as nitrites and aniline dyes and others can cause conversion of hemoglobin to methemoglobin (Adam 1980), in which the iron is in the ferric state, rendering the molecule unable to bind oxygen. Since, the primary physiologic effect of environmental exposure to nitrate is its conversion to nitrite, the presence of high concentration of nitrite in baby foods is considered to be the principle determinant for the occurrence of methemoglobin in infants. The hemoglobin / methemoglobin conversion can be reversed by the enzyme methemoglobin reductase or by administration of methylene blue, which is the usual treatment for diagnosed methemoglobinemia.

Ascorbic acid therapy is often too slow to be useful for the treatment of acute cases (Kross *et al.*, 1992). Vitamin C was demonstrated to provide protection against methemoglobinemia (Shuval and Gruener 1972). The nitrosation reaction can be inhibited by vitamins C and E (Petukhof and Ivanov 1970). Vitamin C plays a major role as an antioxidant and free radical scavenger and blocks the formation of nitrosamines (Ohshima and Bratsch, 1981). As the principal source of nitrite is nitrate from food. Following absorption, part of the nitrate reaches the buccal cavity where microorganisms convert it to nitrite. Consequently, nitrite reaches to the stomach where it can react with amines or amides (Tannenbaum *et al.*,1978) forming nitroso compounds.

$$R_1, R_2\text{-N-H} + HNO_2 \longrightarrow R_1, R_2 - \text{N- N}= 0 + H_2O$$

Nitroso compounds

Nitrostable amines or amides are generally found in many types of foods; they can also be synthesized in the body (Zeise *et al*; 1985). Nitroso compounds have been found to be both hepatotoxic and carcinogenic in experimental animals, There appears to be substantial evidence suggesting that vitamin C has the potential to block the formation of nitrosamine, because the vitamin C- nitrite reaction is more rapid than the amine – nitrite reaction (Tannenbaum *et al.*, 1991) The vitamin reduces nitrite, being oxidized to dehyroascorbic acid in the process, thereby inhibiting the reaction of nitrite with amines

$$2HNO_2 + ASC \longrightarrow 2\ NO + \text{Dehydroasc} + 2H_2O$$

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# محتوى مياه الشرب وأغذية الأطفال من النترات والنيتريت فى مصر وأثر ذلــــك علـــى الصحة

**زينب خليل العوامرى**
**المعمل المركزى للأغذية والأعلاف – مركز البحوث الزراعية – الجيزة – مصر**

أجري هذا البحث بهدف دراسة محتوى مياه الشرب وأغذية الأطفال من النترات والنيتريت فى مصر وأثر ذلك على الصحة. لذلك تم تجميع عينات مياه شرب من ٣ محافظات فى مصر هى القاهرة والقليوبية والجيزة خـــلال عـــام ٢٠٠١ وتم تقدير النترات والنيتريت فيها وكذلك تم تجميع عينات خضار طازجة من الثلاث محافظات الســـابقة وهـــى البطاطس والجزر والكوسة وتم سلقها لتحضيرها كغذاء للأطفال وأيضا تم تجميع عينات فاكهة طازجـــة وهـــى التفـــاح والموز والجوافة والبرتقال وتم تحضير عصير من كلا من الجوافة والبرتقال وأيضا تم تحضير بليلا وأرز مسلوق وفول مدمس وعدس. وكذلك تم تجميع أغذية أطفال من السوق المحلى فى مصر وهى سيريلاك وحرير وريســـرى وحمالكتـــ وفوسفاتين والحرير وتم تقدير النترات والنيتريـــ فى كل من الأغذية السابقة الذكر.

ويمكن تلخيص النتائج فى النقط التالية:-

١. أ- احتوت عينات مياه الشرب لمحافظة الجيزة على كميات عالية من النترات وخاصة منطقـــة البـــدرشين والصف تتراوح من ٢٧ – ٦٩، ٢٢ – ٤٢، – 23 – ٥٤ مللجم / كجم نترات على التوالى ومناطق منخفضة نسبيا فى محتوى النترات وهى امبابه والبدرشين بقيم تتراوح من ٠و – ٧و ، ٠و – ٥ مللجم / كجم بينما كـــان محتـــوى النيتريـــ فى المناطق الســـابقة الذكر صفر – ٣ ، صفر – ٠و ، قر – ٣و١ ، صفر – صفر ، صفر – ٢. و مللجم / كجم على التوالى واحتمال ارتفاع المحتوى فى النترات والنيتريت راجع إلى أن مصدر المياه هى مياه جوفية

ب- بينما احتوت محافظة القاهرة والقليوبية على كميات منخفضة من النترات والنيتريت وتكاد تكون خالية مـــن النيتريـــ حيث كانت أعلى نسبة من النترات فى محافظة القاهرة ٥,١ إلى ٠و مللجم / كجم وفى محافظة القليوبية كـــان أعلى نسبة من النترات كانت من ١٠ الى ٠و مللجم / كجم.

٢. محتوى أغذيه الأطفال من النترات والنيتريت

أ-احتوى الخضار المسلوق وهى البطاطس والجزر والكوسة على ٤٣ – ٩٥ ، ٥٤ – ٩٧ ، ٤٠ – ٧١ مللجم / كجـــم من النترات على التوالى ، بينما احتوى على صفر – ٥ ، صفر – ٣٤ ، صفر – ٤و مللجم / كجم نيتريت علـــى التوالى

ب – كان محتوى الفاكهة الطازجة وهى التفاح وعصير الجوافه والموز وعصير البرتقال من النترات ١٠ – ٢٢ ، ١٥ – ٢٦ ، ٧ – ١٦ ، ١٨ – ٢٩ مللجم / كجم على التوالى بينما كانت الفواكه السابقة الذكر خالية تماما من النيتريت

ج- كان محتوى كل من البليلا والأرز المسلوق من النترات ١٣ – ٢٤، ١٥ – ٢٩ مللجم / كجم نترات على التوالـــى بينما كانت كل منهما خالية تماما من النيتريت.

د- كان محتوى كل من الفول المدمس والعدس المسلوق من النترات ٣٥ – ٤٢، ١٩ – ٢٨ مللجم / كجم نترات على التوالى وكان كل منها خالى تماما من النيتريت.

٣. محتوى النترات والنيتريت فى أغذيه الأطفال الجاهزة من السوق المحلى

أ- أحتوى عينات ارز بالحرير وعينات الحرير وعينات الخضار على أعلى نسب من النترات والنيتريـــ حيث كـــان محتواها ٦٣,٨ ،٥٦، ٤٣,٣٢ مللجم/ كجم نترات و٢,٦٥، ٢,٣ ، ٢,١٥مللجم / كجم نيتريت .

ب-أحتوى عينات الأرز والقمح و ٥ حبوب والقمح باللبن وعينات الخضار بخلاصة اللحم و البروتين وشـــوربه الدجاج على نسب متوسطة من النترات وهـــى ٦,٧٥ ، ١١,١٧ ، ٧,٩٧، ٣٤و٢٢ ، ٤٢و١٠ ، ١٣,٩ ، ٩,٢٤ ، مللجم / كجم نترات بينما كان محتواها من النيتريـــ ٢٣٨ و ٢٤و، ٦٥و، ٢٣,١ ، ١,٣٢ ، ١,٢٤ ، ١,٨٨ مللجم /كجم نيتريت.

ج- كانت عينات ٣ فواكه والبرتقال بالتفاح والفلكس منخفضة القيم من النترات حيث كانت ٤٣ ، ٢٣و ، ٥٨، مللجم / كجم نترات وكانت عينات الفواكه والبرتقال بالتفاح خالية تماما من النيتريـــ واحتوى الفليكس علـــى ٥، ومللجم / كجم نيتريت.

٤. ومن الواضح من نتائج هذا البحث ان معظم أغذية الأطفال التى تجهز فى المنزل والجـــاهزة فـــى الســـوق المحلى ومياه الشرب والتى يتناولها الأطفال ابتداء من الشهر الرابع لاستكمال احتياجاتهم الغذائية نسبيا نسبة من النترات أو النيتريت او كلاهما معا.