

## ESTIMATION OF DIETARY INTAKE OF NITRATE AND NITRITE IN EGYPT

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### ABSTRACT

The present work is planned to estimate the dietary intake of nitrate and nitrite using the total diet study, the method which involves the purchase and preparation of the cooked foodstuffs commonly used in the diet. However, it does not include food consumed outside the home. These foodstuffs were combined into 12 groups of like foods as follows:- Bread and cereals; poultry; meat and meat products; fish ,oil, fats, eggs and dairy products, sugars; vegetables;potatoes; canned vegetables; fresh fruit and fruit products; beverage and milk. Thirty samples, used in the house, from each of the twelve foodstuffs groups were collected monthly from 3 governorates (Cairo,Giza and Kalioubia) during the year 2001 then estimation of nitrate and nitrite in each group.

- 1-a The mean nitrate level in the different cited food groups was as follow: 18,8.3,67,12, 1.3,15,212,125,31,26,1.9 and 1.3 mg/kg, respectively.
- 1-b Also,the mean nitrite level in the different cited food groups was as follow: 1.5 , 1.1 , 5.2 , 1.3 , 1.2 , 1.0 , 3.5 , 12 , 1.8 , 2.1 , 1.1 and 1.0mg/kg, respectively.
- 2- The daily average consumption of the Egyptian citizen (kg /person / day) for each of the twelve foodstuffs groups were: 1.44, 0.032, 0.122 , 0.082 , 0.094 , 0.137,0.303 , 0.100 , 0.003 , 0.073 , 0.01 and 0.177, respectively.
- 3- The mean total nitrate intake (mg / person / day) was estimated and calculated in the different cited 12 foodstuffs groups and the results were as follows: 25,94,0.265,8.174,0.984, 0.122 , 2.055 , 64.2 , 12.5 , 0.093 , 1.898 , 0.019 ,and 0.230, respectively.
- 4- Also, the mean total nitrite intake (mg/person / day) was estimated and calculated in the different cited foodstuffs groups and the results were as follows: 2.16 , 0.035 , 0.634 , 0.106 , 0.112 , 0.137 , 1.060 , 1.2 , 0.005 , 0.153 , 0.011 and 0.177, respectively.
- 5- It was observed that there is an increase in the average total nitrate intake for the Egyptian citizen due to the increase in the average daily consumption of some groups of foods.
- 6- It was observed that there is an increase in the average total nitrite intake for the Egyptian citizen due to the increase in the average daily consumption of some groups of foods.
- 7- It was observed that there is an increase in the average consumption of some food groups per person in Egypt more than the other country of the world. Consequently, there is an increase in the quantity of nitrate and nitrite consumed, which on the long term, may have a harmful effect on general health especially for the children in view of the acute effect of infantile methemoglobinemia which causes oxygen deficiency in the blood.

### INTRODUCTION

Nitrates are present naturally in soil, water and plant materials as a consequence of nitrogen fixation. In addition, the wide use of nitrogen-based fertilizers in agriculture contributes to the total nitrate present in the soil and water. Nitrate is therefore likely to be present in most things we eat or drink. The National Academy of Sciences (NAS, 1981) estimated that vegetables provide 87% of the nitrate in a normal diet. In addition to the nitrate intake from

food, it is estimated that tap water contributed 10 – 20 mg / day on the assumption that the average consumption of water is 1L /day and average concentration of nitrate in tap water ranges between 10 – 20- mg /L (MAFF 1987). The significance of nitrate to human health derives from the fact that 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. Furthermore, nitrite ion can also reacts with secondary and tertiary amines to form N- nitroso compounds through a process known as nitrosation. The resulting concern has led several national authorities to estimate the exposure of their populations to nitrate and nitrite from the diet (NAS, (1981) , Ellen et al (1988), Meah et al (1994) and Massey (1995), Jagerstad and Norden (1997). As with other food additives there is need to estimate the intake of food preservatives by consumers. Of primary importance is the requirement to ascertain that the consumption of preservatives poses a negligible threat to human health.

Additionally, exposure to food preservatives is unlikely to be constant and will change in the future as a consequence of technological developments by the food industry and alterations in dietary habits by the consumer. In order to assess the possible health risks, it is common practice to compare intakes with the Acceptable Daily Intake(ADI). The ADI is defined as an estimate by JECFA (the joint Expert Committee on Food Additives 1973) of the amount of a food additives expressed on a body weight basis, that can be ingested daily over a lifetime without appreciable health risk (WHO, 1987). ADIs are based on the highest intake which does not give rise to observable adverse effects.

In 1973, the joint FAO / WHO Expert Committee on Food Additives (JECFA) in evaluating nitrate and nitrite, set an acceptable daily intake (ADI) of 0-5 mg / kg body weight for sodium nitrate, and an (ADI) of 0-0.2 mg / kg body weight for sodium nitrite (WHO 1973). Subsequently, the European Communities Scientific Committee For Food (SCF) also set an ADI for sodium nitrate at 0-5 mg / kg body weight but established a lower temporary ADI for sodium nitrite or 0-0.1 mg / kg body weight (CEC SCF 1992).

In the UK, concentration of nitrate and nitrite in food have been measured and the dietary intake estimated from the total diet study as part of the government's programme of food surveillance (MAFF 1989). The present work is planned to estimate the dietary intake of nitrate and nitrite in Egypt.

## MATERIAL AND METHODS

### 1- Sampling

Twelve food stuffs groups shown in (Table 1 ) were purchased from 3 governorates (Cairo, Giza and Kalioubia), thirty samples were prepared using all types of cooking in the house were collected monthly during the year 2001 as follows:-

#### 1- Bread and Cereals

Wheat Bread, wheat bread+ Maize , Maize bread + Finogreek , Seed wheat, wheat flour, Maize flour and Macaroni.

**2- Poultry**

**3- Meat and meat products**

Meat of cows and buffaloes, sausages, luncheon, burger and cured meat.

**4 Fish**

**5- Oils, fat, eggs and dairy products**

Maize oil, sun flower oil, olive oil, cotton oil, artificial fat, natural fat, egg, yoghurt, white cheese, cheddar, leicester and edam cheese.

**6- Sugars**

Sugar, honey, molasses, jam and halawa.

**7- Vegetables**

**7-a. Fresh vegetables**

Tomato, cucumber, lettuce, peppers, parsley, carrots, onion, water cress and radish.

**7-b. Cooked vegetables**

Green bean, squash, spinach, cauliflower, cabbage, kolcasia, molokai, okro, pisum and mushroom.

**8- Potatoes**

**9- Canned vegetables**

Okra, molokai, string beans, pisum

**10- Fresh fruit and fruit products**

**10-a- Fresh fruit**

Oranges, apples, pears, grapes, lemon, banana, mango, date, gawava, apricot, plums, fig and pineapple.

**10-b Fruit products (Canned fruit)**

**11- Beverages**

Beverages, tea, Coffee, anise, fenugreek, karcadi

**12- Milk**

Buffaloes milk, cows milk, dried milk and skim milk.

**II- Intake measurement**

A range of different procedures are available for estimating the dietary intake of food preservatives (MAFF 1993). The estimation involves gathering data on food consumption and on the concentration of chemicals of interest in individual foods or in various groups of foods or in whole diets. In this paper, Egyptian dietary intakes of nitrate and nitrite have been estimated using the Total Diet Study (Peattie et al, 1983). This method involves the purchase and preparation, including cooking where appropriate, of common foodstuffs in the national average diet. However, it does not include food consumed outside the home nor alcoholic beverages.

These foodstuffs were combined into 12 groups of like foods, the proportion of each food in each group reflecting the amount of that food in the average diet, and then the food groups were analysed. Intakes were calculated from the knowledge of the weight of each group consumed and the concentrations of nitrate or nitrite in each food group.

### III- Study of food intake for the Egyptian citizen

The average consumption of the Egyptian citizen (Kg / person / day) were calculated for the twelve foodstuff groups by the Nutrition Reseach Institute (1981) as shown in table (1).

Table (1): Study of food intake for the Egyptian citizen \*

Food group	Average consumption (gm/Person/day)	Average consumption (Kg/ person/day)
Bread and cereals	1440	1.440
Poultry	32	0.032
Meat and meat products	122	0.122
Fish	82	0.082
Oils, fats, eggs and dairy products	94	0.094
Sugars	137	0.137
Vegetables	303	0.303
Potatoes	100	0.100
Canned vegetables	3	0.003
Fresh fruit and fruit products	73	0.073
Beverage (non alcoholic)	10	0.01
Milk	177	0.177

\*Nutrition Research Institute, 1981.

### IV. Determiration of nitrate and nitrite

Nitrate and nitrite levels in each of the twelve foodstuff groups were determined according to the method of Sen and Donaldson (1978) using sulfanilic acid and N- (1- Naphthyl) ethylenediamine dihydrochloride, the absorbance at 550 nm. was detected.

## RESULTS AND DISCUSSION

### I. Nitrate and nitrite levels in different food groups

#### 1. Cereals and bread group.

Nitrate and nitrite levels in cereals are usually low and are a function of both species and growing conditions (Walker 1990). Levels of nitrate and nitrite in the combined "bread and cereals" food group were found to be 16 and 1.4 mg/kg, respectively as shown in (Table 2) (MAFF1992). The study in 2001 shown in Table 3) found mean levels of nitrate and nitrite of 18 and 1.5 mg / kg, respectively.

#### 2- Meat and meat products

Most levels of nitrate determined in fresh meat products have been low. Nitrate and nitrite salts have a long history of use as preservatives in cured meat products. Nitrite is the principal active ingredient in curing salt mixture by virtue of its anti-microbial bacterial effects and its continued use is considered to be essential in order to a void the risk of botulism (Holley 1981). In addition, nitrite imparts the characteristic colour and flavour to cured meat. Nitrate and nitrite levels in the meat and meat products were measured and mean levels found were 4.9 and 0.24 mg/kg, respectively ( MAFF 1992). The study in 2001, found mean levels of nitrate and nitrite of 67 and 5.2 mg/kg.

**Table (2): Total diet study on nitrate and nitrite intakes\*\***

Group	Average consumption (kg/person/day)	Nitrate level (mg/kg)		Nitrate intake (mg/person/day)	Nitrite level (mg/kg)		Nitrite intake (mg/person/day)
		Mean	Range		Mean	Range	
Bread and cereals	0.24	16	(8-26)	3.8	1.4	(<1-3)	0.059
Poultry	0.059	8.2	(2-14)	0.48	1.0		0.24
Meat and meat products	0.048	69	(14-180)	3.3	4.9	(1-17)	0.020
Fish	0.017	11	(2-16)	0.19	1.2	(<1-5)	0.12
Oils, fats, eggs and dairy products	0.12	1.2	(<1-2)	0.14	1.0	(<1-1)	0.12
Sugars	0.090	14	(4-27)	1.3	1.0	(<1-1)	0.090
Vegetables	0.050	210	(9-380)	11	3.4	(<1-20)	0.17
Potatoes	0.16	120	(5-410)	19	11	(3-26)	1.8
Canned vegetables	0.042	29	(8-82)	1.2	1.9	(<1-3)	0.080
Fresh fruit and fruit products	0.091	25	(8-81)	2.3	1.0		0.091
Beverage (non alcoholic)	0.66	1.9	(<1-9)	1.3	1.1	(<1-3)	0.73
Milk	0.34	1.4	(<1-3)	0.48	1.0		0.34
<b>Total intake</b>				<b>54</b>	<b>1.4</b>		<b>4.2</b>

\*\*MAFF,1992.

### 3- Fish group

Nitrate and nitrite levels in the fish food group were measured and mean levels found were 11 and 1.2 mg / kg, respectively (MAFF 1992). The study in 2001 found mean levels of nitrate and nitrite of 12 and 1.3 mg / kg, respectively, as shown in (Table 3).

**Table (3): nitrate and nitrite levels in different food groups (mg / kg) in Egypt in 2001**

Food group	Nitrate level (mg / kg)		Nitrite level (mg / kg)	
	Mean	Range	Mean	Range
Bread and cereals	18	9.8-34	1.5	1-3.4
Poultry	8.3	2-15	1.1	1-1.2
Meat and meat products	67	14.6-192	5.2	1.5-19
Fish	12	2-18	1.3	<1-5.6
Oils, fat, eggs and dairy products	1.3	<1-2.4	1.2	<1-1.4
Sugars	15	(6-35)	1.0	<1-1
Vegetables	212	7.3-380	3.5	<1-26
Potatoes	125	91-204	12	3-28
Canned vegetables	31	(12-85)	1.8	<1-3
Fresh fruit and fruit products	26	(16-68)	2.1	<1-3.5
Beverage (non alcoholic)	1.9	(<1-9)	1.1	<1-3
Milk	1.3	(<1-3)	1.0	1.0

### 4- Oils , fats , eggs and dairy products

Nitrate and nitrite levels in dairy products are generally low except where nitrate is directly added as with some cheeses (MAFF 1987). Nitrate and nitrite levels were measured and mean levels found were 1.4 and 1.0 mg / kg (MAFF 1992). The study in 2001 found that mean levels of nitrate and nitrite of 1.3 and 1.2 mg / kg, respectively, as shown in (Table 3).

### 5-Fruit

Nitrate contents of fruits are generally low (White 1975). Nitrate and nitrite levels were measured and mean levels were 25 and 1.0 mg / kg (MAFF 1992): The study in 2001 found mean levels of nitrate and nitrite of 26 and 2.1 mg / kg, respectively, as shown in (Table 3).

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### **6-Poultry**

Nitrate and nitrite levels in the poultry group were measured and mean levels found were 8.2 and 1.0 mg / kg (MAFF 1992).

The study in 2001 , found mean levels of nitrate and nitrite of 8.3 and 1.1 mg / kg, respectively, as shown in (Table 3).

### **7-Sugars**

Nitrate and nitrite levels in the sugars group were measured and mean levels found were 15 and 1.0 mg / kg respectively, as shown in (Table 3).

### **8-Potatoes**

Nitrate and nitrite levels in the potatoes group were measured and mean levels found were 120 and 11 mg / kg (MAFF 1992). The study in 2001, found mean levels of nitrate and nitrite of 125 and 12 mg / kg ,respectively, as shown in (Table 3).

### **9-Vegetables**

Nitrate concentrations in vegetables vary enormously, ranging from around 1 to 10 000 mg / kg fresh weight (MAFF 1987). The nitrite content of most fresh market vegetables is low and usually of the order of 1-2 mg NO<sub>2</sub> / kg (Corre and Breimer 1979). Nitrate and nitrite levels in the vegetables found were measured and mean levels found were 210 and 3.4 mg / kg (MAFF 1992). The study in 2001, found mean levels of nitrate and nitrite of 212 and 3.5 mg / kg, respectively, as shown in (Table 3).

### **10-Milk**

Nitrate and nitrite levels in the milk group were measured and mean levels found were 1.4 and 1.0 mg / kg (MAFF 1992) .The study in 2001 , found mean levels of nitrate and nitrite of 1.3 and 1.0 mg / kg, respectively, as shown in (Table 3).

### **11-Canned vegetables**

Nitrate and nitrite levels in the canned vegetables group were measured and mean levels found were 29 and 1.9 mg / kg , respectively (MAFF 1992). The study in 2001 , found mean levels of nitrate and nitrite of 31 and 1.8 mg / kg, respectively, as shown in (Table 3).

### **12-Beverage (non alcoholic)**

Nitrate and nitrite levels in the beverage group were measured and mean levels found were 1.9 and 1.1 (MAFF 1992). The study in 2001, found mean levels of nitrate and nitrite of 1.9 and 1.1 mg / kg, respectively, as shown in (Table 3).

## **II.1 Dietary intake of nitrate**

By comparing the results of the total nitrate intake in Egypt with the study presented by MAFF 1992, it was found that the average consumption was 116.46 mg /person / day, whereas, the average consumption in the study of the MAFF was 54 mg / person / day. Whereas, the average intake was estimated to be 116 mg / day, with 55.1 % of this total being derived from vegetables as shown in (Table 4). A total diet study carried out in 1979 estimated the average dietary nitrate intake to be 61 mg /day (MAFF 1987). The difference between the two estimates is largely accounted for by the average consumption in Egypt from the different food groups is too high. The Acceptable Daily Intake (ADI) set by the scientific committee for Food (SCF) (1992) for nitrate is 0 to 219 mg /person /day for a 60 kg individual. The estimated intake for nitrate

derived from analysis of total diet samples collected in 1985 is 54 mg /person/day(MAFF 1992). The largest contribution comes from the vegetables group which account for 55.1% of the total followed by bread and cereals group (22.2%) . The potatoes group accounted for 10.73% and the meat and meat products accounted for 7%, whilst the other food groups contributed less than 5% of the total intake. The average intake from tap water is estimated to lie within the range 10 to 20 mg /person/day (MAFF,1992). Taking into account this expected contribution from drinking water, the intake of nitrate is likely to be in the range 126.46 to 136.46 mg /person /day.

**Table (4): Estimated total dietary intake of nitrate (mg/person / day) in Egypt in 2001**

Food group	Average consumption (kg/ person/day)	Nitrate concentration (mg/kg)	Nitrate intake*** (mg/ person/ day)	% Nitrate intake
Bread and cereals	1.44	18	25.92	22.2
Poultry	0.032	8.3	0.265	0.227
Meat and meat products	0.122	67	8.174	7
Fish	0.082	12	0.984	0.87
Oils, fats, eggs and dairy products	0.094	1.3	0.122	0.104
Sugars	0.137	15	2.055	1.76
Vegetables	0.303	212	64.2	55.1
Potatoes	0.100	125	12.5	10.75
Canned vegetables	0.003	31	0.093	0.08
Fresh fruit and fruit products	0.073	26	1.898	1.629
Beverage (non alcoholic)	0.01	1.9	0.019	0.016
Milk	0.177	1.3	0.230	0.2
Total intake			116.46	

\*\*\* Nitrate intake = Average consumption x Nitrate concentration  
(mg/ person/ day) (kg/ person/day) (mg/kg)

% Nitrate intake =  $\frac{\text{Nitrate intake for each foodstuff group}}{\text{Total intake (116.46)}}$

## II.2. Dietary intake of nitrite

By comparing the results of the total nitrite intake in Egypt with the study presented by MAFF 1992, it was found that the average consumption was 5.7932 mg/ person / day, whereas, the average consumption of the study of the MAFF was 4.2 mg / person / day, whereas, the average intake was estimated to be 5.7932 mg/day, as shown in (Table 5). The bread and cereals group showed 37.28 % of the total followed by potatoes group (20.71%). The vegetables and meat products accounted for 18.3 and 10.95 %, whilst the other food group contributed less than 13% of the total intake. The reason for the presence of nitrite in potatoes is not certain, it may arise from microbial reduction of nitrate in the field or during storage orior to cooking. The concentration of nitrite in cured meats decreases rapidly during and after the manufacturing process as a consequence of interaction with other constituents of meat (Cassens et al.,1977).

**Table (5): Estimated total dietary intake of nitrite (mg/person / day) in Egypt in 2001**

Food group	Average consumption (kg/ person/day)	Nitrite concentration (mg/kg)	Nitrite intake (mg/ person/ day) <sup>***</sup>	% Nitrite intake <sup>**</sup>
Bread and cereals	1.44	1.5	2.16	37.28
Poultry	0.032	1.1	0.035	0.60
Meat and meat products	0.122	5.2	0.63	10.95
Fish	0.082	1.3	0.10	1.84
Oils, fats, eggs and dairy products	0.094	1.2	0.112	1.94
Sugars	0.137	1.0	0.137	2.36
Vegetables	0.303	3.5	1.060	18.30
Potatoes	0.100	12	1.2	20.71
Canned vegetables	0.003	1.8	0.005	0.09
Fresh fruit and fruit products	0.073	2.1	0.153	2.64
Beverage (non alcoholic)	0.01	1.1	0.011	0.18
Milk	0.177	1.0	0.177	3.05
Total intake			5.7932	

$$\text{*** Nitrite intake (mg/ person/ day)} = \text{Average consumption (kg/ person/day)} \times \text{Nitrite concentration (mg/kg)}$$

$$\text{** % Nitrate intake} = \frac{\text{Nitrate intake for each foodstuff group}}{\text{Total intake (5.7932)}}$$

### III- International comparison of dietary intakes of nitrate and nitrite

Tables (1 and 3) represent dietary intake estimates for nitrate and nitrite respectively for populations in Egypt and various countries it is ,of course, necessary to exercise caution in comparing dietary intake estimates from different countries because of the different methods used to arrive at these estimates. Nevertheless ,bearing in mind the different methodologies used, the composition and the weights of the diets, and the composition and the weights of the diets, and the agricural and horticultural practices in the various countries, it is remarkable that the estimates for average of approximately 50-116 mg / day ,while for nitrite intakes fall within a range of approximately 0.1 – 5.79 mg / day.

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### تقدير الاحتياج اليومي من النترات والنيتريت في مصر

سعيد عبد المنعم حسن

المعمل المركزي للأغذية والأعلاف - مركز البحوث الزراعية - جيزة - مصر

(1) استهدفت الدراسة الحالية تقدير الاحتياج اليومي من النترات والنيتريت باستخدام طريقة (Total Diet study) حيث تم شراء وتجهيز الأغذية المطبوخة شائعة الاستخدام وهذه المجموعات لا تحتوي على أغذية مستهلكة من خارج المنزل.

وقد تم دمج هذه الأغذية في اثني عشر مجموعة وكل مجموعة تشمل نوعيه متشابهة من الغذاء وهم كالتالي:- الخبز والبقوليات - الدواجن - اللحوم ومنتجاتها - الأسماك - الزيوت والدهون والبيض ومنتجات الألبان - السكريات - الخضروات - البطاطس - الخضروات المعلبة - الفواكه الطازجة ومنتجاتها - المشروبات والألبان.

وقد تم جمع ٣٠ عينة من كل مجموعة من الاثني عشر مجموعة السابقة شهريا والتي تستهلك في المنازل من ثلاث محافظات القاهرة والجيزة والقليوبية خلال عام ٢٠٠١ ثم تم تقدير النترات والنيتريت في كل مجموعة.

١- وكان متوسط مستوى النترات في مختلف مجموعات الأغذية سابقة الذكر

كالتالي:- ١٨ - ٨,٣ - ٦٧ - ١٢ - ١,٣ - ١٥ - ٢١٢ - ١٢٥ - ٣١ - ٢٦ - ١,٩ - ١,٣ مللجم/ كجم على التوالي.

١-ب. أيضا كان متوسط مستوى النيتريت في مختلف مجموعة الأغذية السابقة كالتالي:- ١,٥ - ١,١ - ٥,٢ - ١,٢ - ١ - ٣,٥ - ١٢ - ١,٨ - ٢,١ - ١,١ - ١ مللجم / كجم على التوالي.

(٢) وقد تم الاستعانة بجدول الاستهلاك الغذائي للمواطن المصري الصادر من معهد بحوث التغذية في مصر عام ١٩٨١ وذلك لحساب متوسط الاستهلاك الغذائي بالكيلو جرام / شخص / يوم في الاثني عشر مجموعة من الاغذية السابقة الذكر . وكان متوسط الاستهلاك الغذائي للمواطن المصري في اليوم لهذه المجموعات. الاثني عشر كالتالي ١,٤٤-٠,٣٢ و. - ٠,٢٢ و. - ٠,٨٢ و. - ٠,٩٤ و. - ١,٣٧ و. - ٠,٣٠٣ و. - ٠,٠٠ و. - ٠,٠٠٣ و. - ٠,٠٧٣ و. - ٠,٠١ و. - ٠,١٧٧ و. كجم / شخص / يوم.

(٣) تم تقدير وحساب متوسط المأخوذ الكلي من النترات (مللجم / شخص / يوم) في مختلف مجموعات الاغذية الاثني عشر سابقا الذكر وكانت النتائج كالتالي: ٢٥,٩٤ - ٠,٢٦٥ و. - ٨,١٧٤ - ٠,٩٨٤ و. - ١,٢٢ و. - ٠,٥٥ و. - ٢,٠٥ - ١٢,٥ - ٠,٩٣ و. - ١,٨٩٨ - ٠,١٩ و. - ٠,٢٣٠ و. على التوالي.

(٤) أيضا تم تقدير وحساب متوسط المأخوذ الكلي من النيتريت مللجم / شخص / يوم في مختلف مجموعات الاغذية الاثني عشر السابقة وكانت النتائج كالتالي :- ٢,١٦ - ٠,٣٥ و. - ٠,٦٣٤ و. - ١,٠٦ و. - ٠,١١٢ و. - ٠,١٢٧ و. - ١,٠٦ - ١,٢ - ٠,٥٥ و. - ٠,٥٣ و. - ٠,١١ و. - ٠,١٧٧ و. على التوالي.

(٥) وجد أن متوسط استهلاك الفرد من النترات في مصر ١١٦,٤٦ مللجم شخص / يوم. ومن الملاحظ ارتفاع متوسط المأخوذ الكلي من النترات للفرد المصري بسبب ارتفاع متوسط الاستهلاك اليومي لبعض المجموعات من الأغذية

(٦) أيضا لوحظ ارتفاع متوسط استهلاك الفرد من النيتريت في مصر حيث وجبت ٥,٧٩٣٢ مللجم / شخص / يوم.

(٧) زيادة متوسط استهلاك الفرد في مصر من مجموعات الاغذية عن دول العالم يؤدي بالتبعية إلى زيادة كمية النترات والنيتريت المستهلكة والتي من الممكن على المدى البعيد يكون لها تأثير على الصحة العامة وخاصة بالنسبة للأطفال بسبب تأثيرها المباشر في الإصابة بمرض Methemoglobinemia والتي تمثل في حدوث نقص للاسجوجين وبالتالي شحوب الأطفال وظهور اللون الازرق كدلالة على هذا النقص ولذلك نوصي في هذا البحث بتقنين وتحديد كمية الاغذية المأخوذة وعدم الافراط في تناولها حتى نتجنب المشاكل الصحية بالنسبة للأطفال والكبار