The importance of some vegetables as a public health enhancer for some girls in preparatory stage

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Abstract:

The Present study was carried out to investigate the importance of some vegetables as a public health enhancer for some female students of preparatory stage fifteen girls in the age between 12-15 years were divided into three groups, each group of them ate one kind of the three vegetables (Broccoli, Tomato and Beetroot) for 70 days. Blood samples were collected at zero time and at the end of experimental period. The MDA, TAC, CA, P, HB and C3 were determined. The result showed a significant decrease in the MDA after eating broccoli, with a significant increase in C3. While the second group (tomato) showed significant improvement in both of MDA, TAC, HB and C3 About the third group, who ate the beetroot a significant effect was indicated by a decrease in MDA level and a significant increase in TAC level. From the result of blood analysis in the current study, it can recommended the need to eat vegetables continuously to improve some indicators of public health of human, especially girls in this stage.

Key words: public health, broccoli, beet, MDA and TAC.

Introduction:

According to WHO, children in the age group of 10–19 years are referred to as adolescents (Brenhouse and Andersen, 2011). Adolescents form 18% of the world population and the majority of adolescents (88%) live in developing Countries. Adolescence is a time of rapid physical growth; during this period children gain up to 50% of their. There are biological, psychological, and social changes along with cognitive and emotional changes. Also, the need for independence happen synchronously (Somerville et al., 2010). Due to all of these transitions, adolescence is seen as a nutritional vulnerable time that requires special nutritional needs (Mesias and Navarro, 2011).

Overall, global estimates that 46% of school- age children are anemic. In Egypt, 2 7.4% of adolescents females were overweight and 8.5% were obese. (Jamorabo, Serrano; 2010 and CDC, 2011) acknowledged that nutrition is an input to and foundation for health and development. However, it is common for adolescents to substitute main meals with high-calorie snacks or to skip important meals such as breakfast. In addition,
they consume many foods with a high content of sugar, refined carbohydrates and saturated fats. Furthermore, they do not consume enough fruits and vegetables; they are also prone to adopting monotonous diets or food fads (De Pinho et al., 2014). These poor eating habits lead to child obesity (Grimes, 2013). Which increases risk for cardiovascular disease, hypertension, diabetic mellitus type II and certain types of cancer (Lira, 2010 and Reilly and Kelly, 2011). Therefore, healthy lifestyles intervention programs are important issues for public and government services (Friccelli et al., 2016).

Schools are the preferred setting for the implementation of these programs because most children spend the greatest part of their time in school (Silveira et al., 2011). Fortunately, in this age dietary habits are still developing and can be positive modified. Therefore, we are interested in this research study some vegetables that may have a potential impact on public health and antioxidants such as broccoli (Brassica oleracea var. italica), Tomato (Solanum lycopersicum) and Beetroot (Beta vulgaris).

Adolescence:

Adolescence is the transition period between childhood and adulthood typically between the ages of 10 and 13 years in girls. It is a period in which growth is very fast. In this time, physical changes affect the body’s nutritional needs. Adolescent nutrition is important for the physical growth of the body and for preventing future health problems. (Story, 1992). And also clear storlien et al., (2001). Adolescence is a time to prepare for the nutritional demands of pregnancy and lactation that girls may experience in the future. Under-nutrition negatively affects adolescent girls by:

* Affecting sexual maturation and growth
* Shortage ability to learn and shortage work at maximum productivity
* Affecting of normal bone strength and the development of healthy teeth if a youth doesn’t get enough calcium.
* A plus the risk of poor obstetric outcomes for teen mothers;

Maintenance of nutrients:

The important nutrients that need to increase during adolescence include energy, protein, calcium, and iron.

Energy:

Needs of adolescents are influenced by activity level, and increased requirements to support pubertal growth and development. Adolescents need additional energy for growth and activity. Girls need approximately
2,200 calories each day. To meet these calorie needs, adolescents should choose a variety of healthful foods, such as lean protein sources, low-fat dairy products, whole grains, fruits, and vegetables. They must therefore be well informed in the choice of healthy foods both at home and in school.

**Fats and oils:**

During adolescence, dietary fat play important role as an energy source, agents of metabolic function and a potent gene regulator. The Australian dietary guidelines for children and adolescents recommend 25% of total energy as fat, with less than 10% of energy from saturated fat for adolescence over 15 years (Beresford, 2006). Added Howard, (2006) about protein that. The Protein, adolescents needs to protein to maintenance of existing lean body mass. The protein is important for growth and maintenance of muscle. Adolescents need between 45 and 60 grams of protein each day.

Adolescents can get the protein from beef, chicken, eggs, and dairy products. Protein is also available from some vegetable as soy foods, beans, and nuts. When protein intakes are consistently inadequate, reductions in linear growth, delays in sexual maturation and reduced accumulation of lean body mass may occur. While Added too Howard, (2006) about calcium that.

Calcium is important for building bone mass so as to reduce the risk of fractures and osteoporosis. Additionally, calcium needs during adolescence are greater than they are in either childhood or adulthood. In order to get the required 1,200 milligrams of calcium, teens are encouraged to consume three to four servings of calcium-rich foods each day. Milk provides the greatest amount of calcium in the diets of adolescents, followed by cheese, ice cream and frozen yogurt.

**Donovan et al., (1995)** Iron is important to transporting oxygen in the bloodstream. A deficiency of iron causes anemia, which leads to fatigue, and weakness. The adolescents want to iron increases in as direct consequence of rapid growth and the expansion of blood volume and muscle mass. The onset of menstruation imposes additional iron needs for girls, In order to compensate them with the appropriate quantity of iron to complete the growth of a healthy manner does not affect their health in the future .The Recommended Dietary Allowance (RDA) for iron is 12-15 (mg) per day. Good sources of iron include beef, chicken, pork, legumes, whole grains, and leafy green vegetables such as spinach.

**Vitamins:** Spear, (2002) Haddad and Johnston, (1999) reported that, the requirements for vitamins are increased during adolescence .more
thiamine, riboflavin and niacin are necessary for the release of energy from carbohydrates. The increased rate of growth and sexual maturation increases the demand for folic acid and vitamin B-12. All adolescent girls of childbearing age should be encouraged to consume the recommended amount of folic acid from supplements in addition to intake of food folate from varied diet to prevent congenital malformations at birth. Adolescent girls should take 400 ìg of folate for childbearing age. The rapid rate of skeletal growth demands more vitamin D. Vitamins A, C, and E are needed in increased amount for new cell growth.

**Description of vegetables grown in Egypt:**

**Broccoli classification:**

**Kingdom:** Plantae  
**Order:** Brassicales  
**Family:** Brassicaceae  
**Genus:** Brassica  
**Species:** B. oleracea.  
**Scientific name(s):** Brassica oleracea var. italic.  
**Common name(s):** Chou broccoli, common broccoli and calabrese, cruciferous vegetable *Maggion et al.,* (2010).  

**Broccoli habitat and description:**

**Habitat:** It was originated in Italy about 2000.  
**Description:** Broccoli has large flower heads, usually green in color, arranged in a tree-like structure branching out from a thick, edible stalk. The mass of flower heads is surrounded by leaves. Broccoli resembles cauliflower, which is a different cultivar group of the same species. *Romeiras et al.,* (2016)

**Tomato classification:**

**Kingdom:** Plantae (Plants).  
**Order:** Solanales  
**Family:** Solanaceae  
**Genus:** Solanum  
**Species:** S. lycopersicum  
**Scientific name(s):** Solanum lycopersicum  
**Common name(s):** tomat and tomato *Barboza et al.,* (2013)
Tomato Habitat and description:

**Habitat:** may have originated with the indigenous peoples of México. The Spanish discovered the tomato from their contact with the Aztec peoples during the Spanish colonization of the Americas, then brought it to Europe, and, from there, to other parts of the European colonized world during the 16th century.

**Description:** often red, fruit/berry of the plant **Peralta and Spooner, (2005)**

Beetroot: classification:

**Kingdom:** Plantae

**Order:** Caryophyllales.

**Family:** Amaranthaceae.

**Genus:** Beta.

**Species:** Beta vulgaris.

**Scientific name(s):** Beta vulgaris L.

**Common name(s):** Beet, chard, spinach beet, sea beet, garden beet and white beet **Hindi et al., (2014).**

Beetroot Habitat and description:

**Habitat:** known in North America

**Description:** bright crimson color. It is famous for its juice value and medicinal **Romeiras et al., (2016)**

Subjects and methods:-

**Subjects:**
This study was carried out on fifteen student of the preparatory stage from Sharkia governorate.

**Inclusion criteria:**
All girls met the following criteria were included in the study free from handicaps and disabilities
1-Age: 12 to 14 years old.
2-Free from chronic diseases.
3-Free from handicaps and disabilities
4-Mentally normal
5-Accept to participate in the study
Exclusion criteria:

All girls have one or more from the following criteria were exclude from the study.

1. Any intolerance to milk products
2. Any recent history of acute or chronic debilitating illness
3. Take immune suppressive medicines
4. Have any disabilities or problems
5. Refuse to participate

Investigated vegetables: (Broccoli, Tomato and beets). The vegetables studied were purchased from the local market in Sharkia Governorate

Ethical consideration:

Each one of girls subjects were informed about the protocol, objectives and duration of the study.

Methods:

Preparation of vegetables:

At first, the vegetables were cleaned with clean water, to daily serve fresh and clean and then sliced in a delicious way to increase the appetite to eat it.

Experimental design:

All girls who met the inclusion criteria were enrolled in the study and randomly classified into three equal groups as following.

Group (1) fed on 100 g daily of the first type of proposed vegetables (broccoli) in addition to usual food.

Group (2): fed on100 g daily of the second type of proposed vegetables (Tomato) in addition to usual food.

Group (3) fed on100 g daily of the third type of proposed vegetables (Beetroot) in addition to usual food.

All subjects were ate their regular daily meals without any modification, the dietary intervention continued for 70 days.

Biochemical Analysis:

Blood samples were obtained from subjects by venipuncture at 2 time points:

1. Zero time, (baseline, immediately before the trial began).
At the end of period (after subjects stopped consuming suggested supplementation.

Total antioxidant capacity (TAC) and Malondialdehyde (MDA) were determined according to Koracevic et al., (2001) and Sotah (1978). Calcium was determined according to Pearson, (1970). Phosphorus was determined according to colorimetric methods as described by Page, (1982).

Hemoglobin (HB) was determined according to the method described by Dacie and Lewis, (1998). WBCs (total and differential) were determined according to the method described by Koda-kimble et al., (2001).

C3 was determined according to the method described by Broun et al., (1982).

Results and Discussion:

Table (1): Clinical parameters for group 1(Broccoli) before and after the intervention

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>G1 before mean ± SD</th>
<th>G1 after mean ±SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA</td>
<td>61.5± 20.2</td>
<td>19.6 ±3.3</td>
<td>0.014**</td>
</tr>
<tr>
<td>TAC</td>
<td>1.8± 0.2</td>
<td>3.0±1.5</td>
<td>0.123</td>
</tr>
<tr>
<td>Ca mg/dl</td>
<td>8.1± 0.6</td>
<td>8.7±0.8</td>
<td>0.08</td>
</tr>
<tr>
<td>P  mg/dl</td>
<td>5.0±0.6</td>
<td>5.3±0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>HB g/dl</td>
<td>11.9±0.8</td>
<td>11.9 ±0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>WBCs</td>
<td>5.5±0.6</td>
<td>5.7±0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>C3 mg/dl</td>
<td>166.20±25.1</td>
<td>189.7±19.1</td>
<td>0.01**</td>
</tr>
</tbody>
</table>

**P<0.01  **P<0.01

Table (1) Shows the clinical parameters for group 1(broccoli) before and after the intervention as for malondialdehyde (MDA) level was 61.5±20.2 significantly before intervention them, it decrease significantly 19.6±3.3 after the intervention broccoli group (p<0.01). The results agreed with Bahadoran et al., (2011) who mentioned the occurrence of a significant
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decrease in the level of malondialdehyde, low-density lipoproteins, and the index of oxidative stress, whereas an increase in the total antioxidant capacity in the serum blood of patients with diabetes who ate 5 gm dried broccoli, 10 gm daily for 4 weeks and that by patients who did not eat broccoli and an increased level of malondialdehyde was noted in the kidneys for increasing fat oxidation.. We also notice an increase in the rate of TAC after eating broccoli 3.0±1.5 but before was 1.8±0.2 this result agreed with Slosar and Ferusova, (2009), who showed that, broccoli contains high amounts of antioxidants which have a positive effect on the human body. It is also one of the good sources of vitamin C which has an anticancer effect. It reduces the risk of cardiovascular diseases.

Olives Barb et al., (2006) reported a strong correlation between carotenoids and reduction of the risk of some diseases, such as cancer. In the same table there is a good result in C3 which increase after intake the broccoli, it level was189.7±19.1 mg/dl while before was166.20±25.1mg/dl.

Table (2): Clinical parameters group 2 (tomato) before and after the intervention

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>G2 before mean ± SD</th>
<th>G2 after mean ± SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA</td>
<td>53.8±16.1</td>
<td>20.1±9.3</td>
<td>0.008**</td>
</tr>
<tr>
<td>TAC</td>
<td>1.2±0.4</td>
<td>2.6±0.9</td>
<td>0.04*</td>
</tr>
<tr>
<td>Ca mg/dl</td>
<td>8.5±0.4</td>
<td>8.6±0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>P mg/dl</td>
<td>4.5±0.6</td>
<td>4.8±0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>HB g/dl</td>
<td>11.4±0.8</td>
<td>11.7±0.9</td>
<td>0.02*</td>
</tr>
<tr>
<td>WBCs</td>
<td>6.9±2.8</td>
<td>6.2±0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>C3 mg/dl</td>
<td>128.8±27.8</td>
<td>197.9±20.1</td>
<td>0.01**</td>
</tr>
</tbody>
</table>

**P<0.001
Table (2) shows the mean value of some parameters for group (2) who intake tomato. As for MDA level was $53.8 \pm 16.1$ before intervention while after intake of tomato became $20.1 \pm 9.3$, this result clears the improvement of MDA level and agree with Sahin et al., (2004, 2006) who reported that supplemented with pure lycopene had a significant reduction in MDA values in serum and liver. It has been showed that tomato product consumption can affect also in other antioxidant micro constituents such as $\beta$-carotene. While mean values of TAC was $2.6 \pm 0.9$ after intake of tomato, while it was $1.2 \pm 0.4$ before the tomato intervention, and by reference to study. Canene-Adams et al., (2005) reported that the tomato products play an important role as prevention agent of diseases such as cancer and cardiovascular disease, also the study clears that lycopene and $\beta$-carotene act as an antioxidant.

Vitamin C (ascorbic acid) one of the major active compound of tomato which can counteract the oxidising effects of lipids by scavenging free radicals. In the same table showed significant increase in HB after intervention in this group ($P<0.01$) who was fed on tomato this result was harmony with Harish and Sathishkumar, (2011) who reported that, the presence of iron with vitamin C together helps to form red blood cells, which helps to protect the body from different types of anemia. Finally, there are levels significantly increasing in C3 after intervention ($11.7 \pm 0.9$) in the tomato group. With respect to Ca, P, and WBCs level there are no significantly difference between before and after intervention. This result mean that tomato don't affect the change of these analyzes.

Table (3): Clinical parameters group 3 (beets) before and after the intervention

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>G3 before mean ±SD</th>
<th>G4 after mean ±SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA</td>
<td>$41.2 \pm 7.8$</td>
<td>$18.9 \pm 3.8$</td>
<td>$0.004**$</td>
</tr>
<tr>
<td>TAC</td>
<td>$0.8 \pm 0.1$</td>
<td>$6.9 \pm 2.1$</td>
<td>$0.003**$</td>
</tr>
<tr>
<td>Ca mg/dl</td>
<td>$8.9 \pm 1.4$</td>
<td>$9.3 \pm 0.6$</td>
<td>$0.6$</td>
</tr>
<tr>
<td>P mg/dl</td>
<td>$4.9 \pm 0.5$</td>
<td>$4.9 \pm 0.6$</td>
<td>$0.9$</td>
</tr>
<tr>
<td>HB g/dl</td>
<td>$11.6 \pm 0.5$</td>
<td>$11.3 \pm 0.8$</td>
<td>$0.4$</td>
</tr>
<tr>
<td>WBCs</td>
<td>$5.4 \pm 1.2$</td>
<td>$6.2 \pm 1.1$</td>
<td>$0.03$</td>
</tr>
<tr>
<td>C3 mg/dl</td>
<td>$141.4 \pm 38.5$</td>
<td>$164.5 \pm 95.9$</td>
<td>$0.3$</td>
</tr>
</tbody>
</table>

**$P<0.01$**
The data in table (3) revealed the level of the MDA, TAC, Ca, P, HB, WBCs and C3 of the group (3) that took the beet (before and after). As for MDA, clears the significant difference between before and after (41.2±7.8 and 18.9±3.8). This result mean a marked improvement in MDA for group 3 that ate the beet. Our study agree with Jain et al., (2011) who reported that, when human used beets extract significantly decreased hepatic MDA level.

Beets extract plays an important protective role against ethanol-mediated toxicity. While the result of total antioxidant increased significantly at (P<0.01) after intervention by beet intake (6.9±2.1) which agreement with Grubben et al., (2004) who studied that Antioxidants: Its carotenoids and flavonoids can help decrease the oxidation of LDL cholesterol which could cause to harmed artery walls and ultimately heart attacks and stroke. Also he showed that Betaine, an amino acid in beetroot is important to protect the body from cancers. WBCs showed significant increase after intake of beet by group 3 (P<0.01). On the other side there were no statistical significance in Ca, P, HB and C3.

Table (4): Clinical parameters for the studied groups (Broccoli, Tomato and Beets) after the intervention

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>G1 mean ±SD</th>
<th>G2 mean ±SD</th>
<th>G3 mean ±SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA</td>
<td>19.6±3.3</td>
<td>20.1±9.3</td>
<td>18.9±3.8</td>
<td>0.3</td>
</tr>
<tr>
<td>TAC</td>
<td>B3.0±1.5</td>
<td>B2.6±0.9</td>
<td>B6.9±2.1</td>
<td>0.01**</td>
</tr>
<tr>
<td>Ca mg/dl</td>
<td>8.7±0.8</td>
<td>8.6±0.5</td>
<td>9.3±0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>P mg/dl</td>
<td>5.3±0.3</td>
<td>4.8±0.4</td>
<td>4.9±0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>HB g/dl</td>
<td>11.9±0.9</td>
<td>11.7±0.9</td>
<td>11.3±0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>WBCs</td>
<td>A5.7±0.6</td>
<td>A6.2±0.9</td>
<td>A6.2±1.1</td>
<td>0.01**</td>
</tr>
<tr>
<td>C3 mg/dl</td>
<td>189.7±19.1</td>
<td>197.9±20.1</td>
<td>164.5±95.9</td>
<td>0.3</td>
</tr>
</tbody>
</table>

From table (4) clinical parameters for the studied groups (Broccoli, Tomato and Beets) after the intervention we notice that, the group (3) who intake Beets has made top percentage comparison between group (2) and group (1) in TAC level 6.9±2.1- 3.0±1.5- 2.6±0.9 respectively. While this
result mean a marked improvement in WBCs in group (3) after that group (2) then group (1) (6.2±1.1- 6.2±0.9- 5.7±0.6) respectively.

In inclusion:

The results of our study can included that, the diet supplemented with some vegetables like broccoli and tomato and beets play an important role as enhancer improvement the public health, especially increase the antioxidants level in the body.

References:


Romeiras M.M.; Vieira A.; Silva D.N.; Moura M.; Santos-Guerra A.; Batista D.; Duarte M.C., Paulo O.S. (2016). "'Evolutionary and Biogeographic Insights on the Macaronesian Beta-Patellifolia Species (Amaranthaceae) from a Time-Scaled Molecular Phylogeny." PLoS
The importance of some vegetables as a public health enhancer for some girls in preparatory stage


أهمية بعض الخضروات لتحسين الصحة العامة لبعض الفئات في المرحلة الاعدادية

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3- باحثة بقسم الاقتصاد والمنزلي - كلية التربية النوعية - جامعة الزقاقيق.

الملخص بالعربي

أجرت الدراسة الحالية للبحث عن أهمية بعض الخضروات لتحسين الصحة العامة لبعض الطالبات في المرحلة الاعدادية تم تقسيم 10 فتاة في عمر 15 سنة إلى ثلاث مجموعات ، كل مجموعة منها تناولت نوعا واحدا من ثلاث خضروات (بروكلي، طماطم، البنجر) لمدة 70 يومًا. تم جمع عينات الدم في بداية التجربة وعند نهاية الفترة المحددة للتجربة وأظهرت النتيجة انخفاض معنوي في MDA، TAC، CA، P، HB، WBCs. ثم تحديد كل من بينما اظهرت المجموعة الثانية (الطماطم) تحسنًا C3 بعد تناول البروكلي مع زيادة and C3 ملحوظة في كل من MDA، TAC، C3 and HB. وزيادة كبيرة في مستوي TAC تتناول البنجر فكان هناك تأثير معنوي يشير إلى انخفاض في مستوى MDA ومن نتيجة تحليل الدم في دراستنا الحالية يمكن أن يوصي بضرورة الحاجة إلى تناول الخضراوات بأستمرار لتحسين الصحة العامة للنساء وخاصة الفئات في هذه المرحلة.

الكلمات الدالة: الصحة العامة - البروكلي - البنجر - مالون الدهيد - مضادات الأكسدة.