

Time Trend Mortality of Egyptian Major Non-Communicable Diseases in Relation to Age, Garlic and Onion Consumption

Rania Samy Mohammed , PhD,* Ahmed S Marei, PhD,** Salah Mostafa, MD* Hanan Elgamal, PhD*

* Faculty of Postgraduate Childhood Studies, Ain-Shams University, Main campus, Abasya, Cairo, Egypt

** Fellow, General Organization of Teaching Hospitals and Institutes

Abstract

Background: The relationship between Garlic and Onion consumption and mortality with effect on health policy has been studied to assess the protective effect of Garlic and Onion consumption on major Non- Communicable Diseases (NCDs) such as cardio- vascular, respiratory, gastrointestinal diseases and cancer.

Objective: To study the effect of Garlic and Onion consumption on NCDs in relation to age group [0- 18 years] and gender.

Methodology: It is a cross- sectional descriptive secondary data study obtained from Central Agency for Public Mobilization& Statistics, and Egyptian Ministry of Agriculture along the years from 2009 to 2015. Statistical Analysis was done by EpiInf 7, CDC 2016.

Results: Results indicated that the amounts of garlic and onion consumption per year showed significant relation effects on the prevention of the major non- communicable diseases. The leading cause of mortality among Egyptians are: 66.37%, 14.16%, 10.96%, and 8.52% of the major NCDs (CVDs, digestive diseases, respiratory diseases, and cancer), respectively. Multiple regression analysis for the studied predictors garlic intake and onion intake [kgm/year and gm/days] show multiple $R=0.467$ for CVDs ($P=0.014$). The most important predictor is in this model, $\beta=-0.467$ ($P=0.014$) for garlic and onion intake in Kgm/year.

Conclusion: The consumption of Garlic and Onion has role for prevention of these major non- communicable diseases.

Recommendation: It is recommended to encourage increased consumption of Garlic and Onion for prevention of these major non-communicable diseases.

Keywords: NCDs, Mortalities, CVDs, Cancer, Respiratory, Digestive, Intake, Garlic, Onion, Age, Gender.

تأثير الزمن على الوفيات من الأمراض غير المعدية الرئيسية وعلاقتها بالسن والنوع والاستهلاك من الثوم والبصل

المقدمة: تم دراسة العلاقة بين استهلاك الثوم والبصل والوفيات مع التأثير على سياسة الصحة لتقييم التأثير الوقائي لاستهلاك الثوم والبصل على الأمراض غير المعدية الرئيسية مثل أمراض القلب والأوعية الدموية والجهاز التنفسي والجهاز الهضمي والسرطان.

الهدف: دراسة تأثير استهلاك البصل والثوم على الأمراض غير المعدية فيما يتعلق بالفئة العمرية (0-18) سنة والجنس.

المنهجية: دراسة وصفية ثانوية مستعرضة من المعلومات التي تم الحصول عليها من الجهاز المركزي للتعبئة العامة والإحصاء، ووزارة الزراعة المصرية على مدى السنوات من 2009 إلى 2015 وتم إجراء التحليل الإحصائي بواسطة إبينفو 7، سدك 2016.

النتائج: أظهرت نتائج الدراسة الحالية أن كميات الثوم والاستهلاك في السنة له آثاراً معنوية ذات علاقة على الوقاية من الأمراض غير المعدية الرئيسية التي تعد السبب الرئيسي للوفيات بين المصريين 66.37%، 14.16%، 10.96%، و 8.52% من الأمراض غير المعدية الرئيسية، مثل أمراض القلب الوعائية وأمراض الجهاز الهضمي وأمراض الجهاز التنفسي والسرطان على التوالي. ويظهر تحليل الانحدار المتعدد للتنبؤات المدروسة، أي تناول الثوم والبصل [كجم/ سنة وغم/ يوم] متعددة $R=0.467$ للأمراض القلبية الوعائية، قيمة $p=0.014$. أهم متنبأ هو في هذا النموذج، $\beta=-0.467$ ، قيمة $p=0.014$ لتناول الثوم والبصل في كجم/ سنة.

الخلاصة: إن تناول الثوم والبصل لهم تأثير وقائي ضد بعض غير المعدية وخاصة أمراض القلب الوعائية.

التوصيات: تشجيع زيادة استهلاك الثوم والبصل للوقاية من هذه الأمراض الرئيسية غير المعدية.

الكلمات الدالة: الأمراض غير المعدية- وفيات- أمراض القلب الوعائية- السرطان- الجهاز التنفسي- الجهاز الهضمي- تناول الثوم- البصل- العمر- النوع.

Introduction:

The Allium genus includes garlic, onions, chives, shallots and leeks. These vegetables are known worldwide for their valuable medicinal properties. Although there are limited epidemiologic studies which assessed Allium consumption, some associations of Allium vegetable consumption with decreased risk of cancer have been reported, particularly cancers of the gastrointestinal tract (Holly et.al., 2015).

The majority of supportive evidence for the cancer protective effect of Allium vegetables comes from mechanistic studies. These studies show the potential mechanisms by which extracts of these vegetables and individual sulfur-containing compounds can be beneficial, including decreased bioactivation of carcinogens, antimicrobial activities and redox modification. Allium vegetables and their components affect all stages of carcinogenesis and influence many biologic processes that can modify cancer risk (Holly et.al., 2015).

Traditionally, garlic has been used for treatment of rheumatism, heart disease, diabetes, diarrhea, wounds, infections and many other disorders. In addition, several beneficial effects of garlic have been proved experimentally such as antilipidemic, antihypertensive, antineoplastic, antibacterial, immunostimulant and hypoglycemic actions. Clinically, garlic has been tested for treatment of a number of conditions, including hypertension, hypercholesterolemia, intermittent claudication, diabetes, rheumatoid arthritis and common cold and for the prevention of arteriosclerosis and cancer in addition to its effect as an insect repellent. Systematic reviews are available for the possible anti-hypertensive, antithrombotic, antilipidemic, and chemo-preventive effects of garlic (Aviello et.al., 2009).

The beneficial medical effect of garlic on almost all physiologic systems has been widely known for centuries. Aged garlic extract (AGE) (Chandrashekar et.al., 2012) is synthesized from organically grown garlic cloves (*Allium sativum* L.), after being sliced and soaked in an aqueous ethanol solution, extracted and aged up to 20 months.

Several compounds have been detected in AGE that can affect immune system, including lectin family, which is known to bind to pathogen recognition receptors on immune cell surfaces (Kingeter et.al., 2012). Fructo- oligosaccharide and N α- fructosyl arginine are aged garlic compounds. They have structures resembling pathogen-associated molecular patterns, which interact with immune cells (Chandrashekar et.al., 2011).

Chandrashekar and Venkatesh et.al., proved that the fractions from AGE acted as adjuvants to IgG production in mice which are treated with ovalbumin as the antigen.

Recent studies have proved the effectiveness of AGE on the immune response against implanted tumors in mice. Ebrahimipour et.al. and Fallah- Rostami et.al., investigated immune responses against implanted fibrosarcoma cells in mice. Naltrexone is an opioid antagonist and it was used with or without AGE in the study. The use of AGE plus naltrexone increased survival times, inhibited tumor growth and augmented the

immune response, mainly cytotoxicity, as well as the CD4+ to- CD8+ ratio and IFN- γ production. Similarly, the use of AGE alone also increased survival time, reduced tumor growth and increased the production of IFN- γ.

Objective:

The aim is to study the effect of Garlic and Onion consumption on NCDs in relation to age group (0- 18) years and gender.

Methodology:

It is a cross- sectional descriptive secondary data study obtained from Central Agency for Public Mobilization & Statistics and Egyptian Ministry of Agriculture along the years 2009 to 2015 to show the relationship between Garlic and Onion consumption and incidence of non-communicable diseases. Statistical Analysis was done by Epi Info 7, CDC, 2016.

Results & Discussion:

Table (1) Frequency of Total Mortality from Birth till 18 Years, of Both Sexes of NCDs, Egypt, 2009- 2015

Type	Y 2009	Y 2010	Y 2011	Y 2012	Y 2013	Y 2014	Y 2015	Total
Cancers	28063	30605	30454	32041	33473	35349	34746	224731
CVDs	190710	183152	179342	194264	249307	254816	270770	1522361
Respiratory	25305	26613	26746	30040	41250	42294	44692	236940
Digestive	48699	51608	54511	57088	56538	58590	57749	384783

Table (2) Percent of Mortality from Birth till 18 Years, of Both Sexes of NCDs, Egypt, 2009- 2015

Diseases Types	Y 2009%	Y 2010%	Y 2011%	Y 2012%	Y 2013%	Y 2014%	Y 2015%
Cancers	9.59	10.48	10.46	10.22	8.80	9.04	8.52
CVDs	65.13	62.73	61.62	61.98	65.51	65.16	66.37
Respiratory	8.64	9.11	9.19	9.58	10.84	10.82	10.96
Digestive	16.63	17.68	18.73	18.21	14.86	14.98	14.16

Table (3) Frequency of Mortality from Birth till 18 Years, of Male NCDs, Egypt, 2009- 2015

Diseases Types	Y 2009	Y 2010	Y 2011	Y 2012	Y 2013	Y 2014	Y 2015	Total
Cancers	16089	17172	17099	18081	18423	19600	18904	125368
CVDs	97987	94233	9474	101993	135437	134864	144060	803315
Resp s.	13627	14196	14593	16385	22108	22820	24083	127812
Digestive s.	30693	32725	34169	35464	35203	36163	35023	239440

S. = System, Chi2= 5862.4, P= 0.000001

Table (4) Percent of Mortality from Birth till 18 Years, of Male NCDs, Egypt, 2009- 2015

Diseases Types	Y 2009%	Y 2010%	Y 2011%	Y 2012%	Y 2013%	Y 2014%	Y 2015%
Cancers	10.20	10.85	10.64	10.52	8.72	9.18	8.51
CVDs	61.86	59.52	58.99	59.32	64.14	63.18	64.87
Resp S.	8.60	8.97	9.09	9.53	10.47	10.69	10.84
Digestiv S.	19.38	20.67	21.28	20.63	16.67	16.94	15.77

S. System

Table (5) Frequency of Mortality from Birth till 18 Years, of Female NCDs, Egypt, 2009- 2015

Diseases Types	Y 2009	Y 2010	Y 2011	Y 2012	Y 2013	Y 2014	Y 2015	Total
Cancers	11974	13433	13355	13960	15050	15749	15842	99363
CVDs	92723	88919	84601	92271	113870	119952	126710	719046
Resp S.	11678	12417	12153	13655	19142	19474	20609	109128
Digestive S.	18006	18883	20342	21624	21335	22427	22726	145343

S.= System, Chi2= 2506.2, p= 0.000001

Table (6) Percent of Mortality from Birth till 18 Years, By Percent of Female NCDs, Egypt, 2009- 2015

Diseases Types	Y 2009%	Y 2010%	Y 2011%	Y 2012%	Y 2013%	Y 2014%	Y 2015%
Cancers	8.91	10.05	10.24	9.87	8.88	8.87	8.52
CVDs	69.00	66.53	64.85	65.20	67.22	67.54	68.17
Resp S.	8.69	9.29	9.32	9.65	11.30	10.96	11.09
Digestiv S.	13.40	14.13	15.59	15.28	12.59	12.63	12.23

S.= System

Table (7) Onion and Garlic [On. Garl.] Intake in Kg per Year, Egypt 2009- 2015

	On. Garl. Kg. Y. 2009	On. Garl. Kg. Y. 2010	On. Garl. Kg. Y. 2011	On. Garl. Kg. Y. 2013	On. Garl. Kg. Y. 2014	On. Garl. Kg. Y. 2015
NCD	17.9	18.6	19.8	15.0	18.2	22.1

Table (8) Onion and Garlic [On. Garl.] Intake in Gm per Day, Egypt, 2009- 2015

	On. Garl. Kg. Y. 2009	On. Garl. Kg. Y. 2010	On. Garl. Kg. Y. 2011	On. Garl. Kg. Y. 2013	On. Garl. Kg. Y. 2014	On. Garl. Kg. Y. 2015
NCD	49.1	51.0	54.2	41.1	49.8	60.6

Table (9) Correlation of major NCDs mortalities and onion and garlic intake

Major Ncds	Onion And Garlic Intake In Kgm/Y	P- Value	Onion And Garlic Intake Gm/D	P- Value
CVDs	0.371	0.057	0.636	0.000
Digestive	- 0.467	0.014	- 0.257	0.196
Respiratory	- 0.511	0.006	- 3.41	0.082
Cancer	- 0.515	0.006	- 0.363	0.063

Table (10) Multiple regression analysis of major NCDs mortalities CVDs and onion and garlic intakes

Major Of Ncds	R	F	P- Value
CVDs	0.467	6.959	0.014
Predictors	Standardized Coefficients, Beta	t	Significant
Onion and garlic Kgm/y	- 0.467	- 2.638	0.014

Note: Onion and garlic intake kgm/y

Table (11) Multiple regression analysis of major NCDs mortalities Digestive and onion and garlic intakes

Major Of Ncds	R	F	P Value
Digestive	0.511	8.822	0.006
Predictors;	Standardized Coefficients, Beta	t	ignificant
Onion and garlic, kgm/y	- 0.511	- 2.970	0.006

Note: Onion and garlic intake kgm/y

Table (12) Multiple regression analysis of major NCDs mortalities cancer and onion and garlic intakes

Major Of Ncds	R	F	P Value
Cancer	0.515	9.022	0.006
Predictors;	Standardized Coefficients, Beta	t	Significant
Onion and garlic intake, Kgm/y	- 0.515	- 3.004	0.005

Note: Onion and garlic intake Kgm/y

Table (13) Multiple regression analysis of major NCDs CVDs mortalities and onion and garlic intakes

Major Of Ncds	R	F	P Value
Respiratory	0.610	14.225	0.001
Predictors;	Standardized Coefficients, Beta	t	Significant
Onion and garlic, gm/d	0.616	3.772	0.001

Note: Onion and garlic intake gm/d

Cardiovascular disease is the leading cause of death worldwide and hypertension remains a major contributing factor to cardiovascular disease-associated mortality (Pearson, et.al., 1993).

Table (1) shows the total number between years 2009 and 2015 was 1522361 with total percentage of mortality rate per year in relation of total mortality shown in table (2).

The distribution of mortality rates among both sexes is shown in tables (3), (4), (5), (6) where total male mortality was 803315 with percentage of

total mortality shown in table (4), while total females mortality was 719046 with percentages of total mortality shown in table (6).

In developing countries, the high morbidity rates of cardiovascular diseases are due to the increase in the prevalence of atherosclerotic diseases. In addition, obesity, diabetes and hypertension play an important role (Murray et.al., 1996).

Similarly, there is also a predicted increase in cardiovascular disease mortality in developing versus developed countries (124% and 107% increase among men and women in developing countries versus 78% and 56% increase among men and women in developed countries) (Reddy et.al., 1998).

Epidemiological evidence suggests that bad dietary habits, especially the increase in the use of energy-dense diets with unhealthy fats, oils and sugars, has contributed to an increase in cardiovascular diseases in developing countries (Hu, 2008). The use of complementary and alternative treatment for hypertension is increasing common due to poor satisfaction with the conventional antihypertensive treatment. Garlic preparations, as a possible form of complementary alternative medicine, are one of the most popular forms of herbal supplements in the United States. The 2002 US National Health Interview Survey showed that 421 of 10,525 (4%) persons with cardiovascular disease in the United States used garlic preparations (Wood et.al., 2003).

Garlic is suggested to have a moderate BP-reducing effect. A published meta-analysis of 11 randomized controlled trials, investigating the effect of garlic on BP concluded that garlic preparations are better than placebo in reducing BP (Wood et.al., 2003).

Gastro-intestinal system diseases are considered the second leading cause of death after cardiovascular disease. The most common cause of gastro-intestinal morbidity and mortality is hepatitis C virus complications as liver cirrhosis and portal hepatocellular carcinoma (World Health Organization, 2010).

Total mortality from birth to 18 years of age from 2009 to 2015 was 384783 while percentage per year is shown in table (2). Tables (3), (4), (5), (6) show the total mortality and percentage per year in both males and females with total of 239440 in males and 145343 in females. The third cause of mortality is respiratory system disease, which dramatically increased in Egypt from 5.390 at 2008 up to 8% at 2014 with no reported differences between both sexes (World Health Organization, 2010).

Total mortality from birth to 18 years of age from 2009 to 2015 was 384783 while percentage per year is shown in table (2). Tables (3), (4), (5), (6) show the total mortality and percentage per year in both males and females with total of 239440 in males and 145343 in females.

Among the respiratory system diseases, chronic obstructive Lung disease is the most common and it is responsible for about 20% of mortality worldwide (Lodenkem et.al., 2013).

Total mortality from birth to 18 years of age from (2009 to 2015) was (236940) while percentage per year was shown in table (2). Tables (3), (4), (5), (6) show the total mortality and percentage per year in both males and

females with total of 127812 in males and 109128 in females.

An association between garlic and onion intake and reduced risk of developing chronic obstructive pulmonary disease has been documented (World Health Organization, 2010).

The fourth leading cause of death in Egypt is cancer. The rates increase steadily over years from 5.4% at 2008 to 6.7% at 2014 without any notable differences between both sexes. There are several risk factors that lead to cancer mortality, including diet, physical activity, air pollution and reproductive health. The population attributable fraction for all cancer sites world wide considering the joint effect of these factors is about 35% (Weiderpass, 2010).

Total mortality rate from birth to 18 years of age from 2009 to 2015 was 224731 while percentages per year are shown in table (2).

Tables (3), (4), (5), (6) show total mortality rates and percentage per year with total of 125368 for males and 99363 for females.

Changing dietary habits may be considered as a practical and cost-effective way for reducing cancer risk and modifying tumor behavior. Approximately 30% to 40% of cancers can be prevented by healthy nutrition and appropriate food intake, physical activity and maintenance of ideal body weight. There is an increasing public demand for identifying those dietary habits, bioactive foods and components that may decrease cancer risk. One particular type of food that has raised considerable interest for their putative cancer- preventive effects, is the Allium genus. There is strong epidemiologic evidence that points to the protective effects of garlic and/ or onions against cancers of the gastrointestinal tract (World Cancer Research Fund, 2007).

A recent meta- analysis of 19 case- control and two cohort studies, comparing the highest and lowest consumption groups of Allium vegetables, suggested that consumption of large amounts of total Allium vegetables has reduced the risk of gastric cancer. Similar results were found for individual Allium vegetables, including garlic, onion, Chinese chives, leeks, scallions and garlic stalks, but not onion leaves. The summary OR for decreased risk of gastric cancer with an increment of 20 g/d of total Allium vegetables (the average weight of one garlic bulb) was 0.91 (95% CI, 0.88- 0.94)(Zhou et.al., 2011).

Epidemiologic studies provide variable evidence for cancer- preventive effects of garlic, onion and related Allium vegetables, but stronger evidence has been found for prevention of cancers of the gastrointestinal tract, including gastric, colorectal, and to some extent esophageal cancers. However, there is individual variability in the response to increased consumption, based on a number of factors including genetics, preparation of the vegetables and other dietary components. In addition, body composition, past history of cancer or precancerous conditions and other cancer risk factors also contribute to determining the response. Moreover, there are number of factors that are currently largely unexplored in studies on association between Allium intake and cancer risk, which may also influence responses including epigenetic modifications and variability in the gut microbiome (World Cancer Research Fund, 2007).

Few intervention studies have investigated the efficacy of dietary or supplemental Allium vegetables in cancer prevention. One double- blind randomized controlled trial, done on Japanese patients with colorectal adenomas revealed that a higher dose of aged garlic extract reduced the risk of new colorectal adenomas by 50% compared with a lower dose garlic extract (Tanaka et.al., 2004).

These findings are in agreement with the results of our recent study which are shown in tables (7), (8) with the consumption rates of garlic and onion between years 2009 and 2015.

Conclusion:

The consumption of Garlic and Onion has role for prevention of these major non- communicable diseases.

Recommendation:

It is recommended to encourage increased consumption of Garlic and Onion for prevention of these major non- communicable diseases.

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