

Review on Health Benefits of Fruit and Vegetables Consumption: Preventive Implications for Non-communicable Diseases in Ethiopia

Tamiru Yazew*

Department of Food Science and Nutrition, College of Agriculture, Shambu Campus, Wollega University, Shambu, Ethiopia, Box 38, Shambu, Ethiopia

Agama Daba

Department of Food Science and Nutrition, College of Agriculture, Shambu Campus, Wollega University, Shambu, Ethiopia, Box 38, Shambu, Ethiopia

Abstract

Globally, the low consumption of fruit and vegetables (FV) below the requirement is contributed to increase the incidence of non-communicable diseases (NCDs) like obesity, cardio vascular disease, cancers and leading cause of death worldwide. Therefore, the objective of this review was to document existing information concerning the health benefits of FV consumption and their potential role for the prevention of NCDs in Ethiopia. Related and published researches have reviewed and discussed critically. In Ethiopia, the total domestic consumption of fresh FV was estimated at 760,000 metric tons however, low FV was consumed (1.5%) compared to other regions of the world. Ethiopia's per capita consumption of fresh fruits is approximately 7kg/person/year which is far below the recommended minimum level of dietary intake (146kg/person/year). The review also showed that the burden of NCDs in Ethiopia is increasing and estimated to account for 30% of total deaths. Despite the increasing burden of NCDs, health systems and public health policies have been mostly focused on controlling infectious diseases, under nutrition and micronutrient deficiencies. A comprehensive strategic action plan for the prevention and control of NCDs and its associated risk factors was also developed in the country but, there is a need for a better understanding of the burden of dietary risk factors and their contribution to NCDs to achieve the goals of the strategic plan effectively and efficiently. Moreover, this review identified that family income, lower paternal educational, poor nutritional knowledge and practice issues were associated to low FV consumption. However, there are no adequate data at national level in Ethiopia to identify barriers to low FV consumption. Fruit and vegetables intake need to be promoted through mass media, nutrition education intervention and multi-sectorial approaches to prevent non-communicable diseases.

Keywords: Fruits, vegetables, non-communicable diseases, prevention, Ethiopia

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1. Introduction

Fruit and vegetables (FV) consumption is crucial to the availability of micronutrients to the body as they are a rich of vitamins and minerals which are required for the normal functioning of the human body (Ruel *et al.*, 2011b; Oyebode *et al.*, 2014). They are also rich in fiber, phytochemicals, essential micronutrients, which act as antioxidants like vitamin A, C and E (Slavin & Lloyd, 2012).

According to the Centers for Disease Control and Prevention (CDC), eating more FV is associated with lower low density lipoprotein cholesterol levels and it is an important part of a weight management strategy to reduce the risk of cancer (CDC, 2011). Consumption of FV is also associated with a reduced risk of obesity, cancers cardio vascular disease (CVD) (Ruel *et al.*, 2011b). Therefore, FV are an important component of a healthy diet and, if consumed daily in sufficient amounts, it could reduce major diseases such as CVDs and certain cancers.

Despite an increasing focus on the health benefits of FV, their consumption is below the recommended intake among adults (MMWR, 2010). According to the World Health Organization (WHO), adequate FV intake entails a consumption of at least 400g of FV per day (Ruel *et al.*, 2011b). However, adults across the United States exhibit an overall low consumption of FV (Lee-Kwan *et al.*, 2017). Globally, the low consumption of FV below the requirement is contributed to increase the incidence of CVDs and cancers; the two leading causes of death worldwide (Ruel *et al.*, 2011b). For example, NCDs are currently the leading cause of death which accounts 70% worldwide (WHO, 2017).

The WHO estimated that low FV consumption contribute to approximately 2.7 million deaths per year from chronic diseases, 11% of CVDs and 31% of ischemic heart diseases worldwide (Ruel *et al.*, 2005a). Low consumption of FV has also been ranked the sixth major risk factor for mortality in the world (Ruel *et al.*, 2005a). The incidences of these chronic diseases are increasing in developing countries due to their life style and dietary

changes. The high prevalence of micronutrient deficiencies in developing countries has been attributed to the low knowledge of the nutritional value of these fruits and vegetables (Hart *et al.*, 2005).

Moreover, a study was done by the WHO to determine which developed countries had national average FV consumptions which were within recommended values and out of the 21 studied countries, only Israel, Spain and Italy had acceptable national average intakes of at least 400g/day (Ruel *et al.*, 2005a). It has been noted that even in developed countries, the intake of fruit and vegetables is lower (CDC, 2011); and this could be due to low knowledge and attitude regarding FV intake.

In Ethiopia, the total domestic consumption of fresh fruits was estimated at 760,000 metric tons. However, low FV is consumed in Ethiopia compared to other regions of the world. For instances, Ethiopia's per capita consumption of fresh fruits is approximately 7 kg/person/year which is far below the WHO and FAO recommended minimum level of dietary intake (146kg/person/year). The prevalence of FV consumption in Ethiopia was very low 1.5% (Terefe *et al.*, 2018).

The burden of NCDs in Ethiopia is also increasing and was estimated to account for 30% of total deaths (WHO, 2014). The estimated age-standardized death rates of all NCDs in Ethiopia were 556.1 per 100 000 population in men and 404.2 in women, and over 60% of NCDs related deaths occurred among those under 70 years old (WHO, 2014). Prevalence of overweight was estimated to be increasing, while many people are still undernourished (Tebakaw *et al.*, 2014). Despite the increasing burden of NCDs, health systems and public health policies have been mostly focused on controlling infectious diseases, under nutrition and micronutrient deficiencies.

Ethiopia has developed a comprehensive strategic action plan for the prevention and control of NCDs and its associated risk factors (EPHI, 2016). Whilst the strategic plan is helpful in guiding interventions, there is a need for a better understanding of the burden of dietary risk factors and their contribution to NCDs in order to achieve the goals of the strategic plan effectively and efficiently. However, there are no adequate national level data or surveillance systems to identify risk factors. Therefore, the main objective of this review was to document existing information on the health benefits of FV consumption and their potential role for the prevention of NCDs in Ethiopia.

2. Related Literature Review

2.1 Health Benefits of Fruit and Vegetables

Eating a diet rich in FV as part of an overall healthy diet can help protect against a number of serious and costly chronic diseases, including heart disease, type II diabetes, some cancers, and obesity. FV are a significant source of water and nutrients such as vitamins, minerals, and fiber that help the human body work as it should and fight off illness and disease (US, 2015). FV have components that give them nourishing properties, appearance, texture, and color specific to this group of foods (Morillas & Delgado, 2012). Phytochemicals in FV are mostly responsible for a protective effect against stomach, colon, breast, lung and prostate cancer diseases. Phytochemicals like phenolic acids & flavonoids are rich in FV (Mcguire, 2011), and they are known as natural secondary plant metabolites that mainly provide protection against abiotic or biotic stress. Sufficient intake of FV has been related epidemiologically with reduced risk of many non-communicable diseases. Higher total FV intake is also associated with lower risk of cognitive decline hence proved beneficial for mental health (Payne *et al.*, 2012). Much interest are focused on the vital role of antioxidants which impart bright color to FV and act as scavengers cleaning up free radicals before they cause detrimental health effects (Kaur & Kapoor, 2001). Moreover, fibers found in FV have been shown to reduce intestinal passage rates by forming a bulk, leading to a more gradual nutrient absorption (Anderson *et al.*, 20105); hence preventing constipation. They can be fermented in the colon, increasing the concentration of short chain fatty acids having anti-carcinogenic properties and maintaining gut health (Lattimer & Haub, 2010).

Table 1. Proportion of children who did not eat any of the common vegetables & fruits in Ethiopia.

Region	N	Vegetables (%)	Fruits (%)
Afar	254	85.0	83.5
Tigray	295	77.6	88.1
Amhara	267	61.8	30.3
Addis Ababa	354	59.3	33.9
Oromia	236	18.6	28.0
Southern Nations Nationalities and Peoples' Region	284	7.0	35.2
Benishangul Gumuz	300	38.3	41.3
Harari	287	35.5	23.3
Dire Dawa	275	15.6	31.6
National	2552	38.1	36.5

Source: (Tsegaye *et al.*, 2009).

Table 2. Fruit and vegetable consumption patterns in Sub Saharan Africa

	Country				
	Ethiopia	Rwanda	Kenya	Uganda	Ghana
% of households consuming fruits & vegetables (FV)	94	94	91	89	99
Quantity in kg/ person/year	26.7	62.8	114.0	64.2	73.7
% of households consuming less than 146 FV in kg/ person/year	99	90	47	88	87

Source: (Ruel, 2005a)

Table 3: Fruit and vegetables consumption in adults in selected countries

Country	Year of up-dated data	Mean Fruit intake (g/d)	Mean Vegetable intake (g/d)
Developed			
Hong Kong (China)	2010	146.81	176.96
Denmark*	2013	151.70	162.08
Germany*	2013	171.36	118.02
UK*	2013	130.02	97.86
France*	2013	136.56	145.15
US**	2015	189.30	255.00
Netherlands*	2013	102.36	127.79
Italy*	2013	90.83	150.81
Austria*	2013	163.58	89.52
Developing			
Malaysia	2012	179.00	133.00
India**	2015	158.20	105.70
Ghana**	2015	149.80	36.10
Ethiopia**	2015	114.70	51.20
Uganda**	2015	464.10	24.40
Samoa**	2015	441.00	9.10

Source: * Data from EFSA database (EFSA, 2013), ** Data from GEMS/Food database (WHO, 2016).

2.2 Fruits and Vegetables Consumption

It is widely accepted that FV are important component of a healthy diet and that the consumption can help prevent a wide range of diseases. The WHO and FAO recommends a minimum of 400g of fruit and vegetables per day for the prevention of chronic diseases as well as for the prevention and alleviation of several micronutrient deficiencies. Despite the growth recorded in the global FV production and trade, the food consumption per capita in Africa is still below the recommended 400 gram of FV per day (=146 kg/person/year. The substantial shortages in utilization are confirmed by the levels of FV consumption in Sub-Saharan African countries. A study done in ten different countries including Ethiopia, Kenya, Ghana, Rwanda and Uganda show that consumption ranges from 27 to 114 kg per person per year, which is far below the recommended amount (Ruel *et al.*, 2005a). Except for Kenya, the majority of the households consume less than the minimum amount of FV recommended by the WHO and FAO.

2.3 Barriers to Fruit and Vegetables consumption

The major preventable risk factor contributing to the burden of disease worldwide is a poor diet like inadequate FV consumption (EPHI, 2016; WHO, 2016). Health problems are related to specific nutrients (Galland, 2010), and overall eating habits (Barbresko *et al.*, 2013), while disease factors are generally associated with foods or dietary habits, with or without the presence of obesity (Calder *et al.*, 2011). Another study done in US showed that individuals who consumed high levels of dietary fat and too little fiber and limited fruit and vegetables were most at increased risk of heart disease, stroke, and cancer (Mcguire, 2011).

According to a study done in Brazil, family income, lower paternal educational and consumption of high sugar content beverages were significantly associated with low FV consumption (Valmorbida & Vitolo, 2014). Other barriers such as poor nutritional knowledge and practice, cost, dislike of FV issues were found to be highly predictive of low fruit and vegetable intakes (Appleton *et al.*, 2010).

A nationwide survey conducted in Ethiopia reported that the risk factors of NCDs were low fruit/vegetable intake, low physical activities, overweight, hypertension, and raised fasting blood glucose (EPHI, 2016). Other studies done in Ethiopia and Bangladesh also showed that the risk factors of NCDs were smoking, alcohol consumption, low consumption of FV and low level physical activity (Fessahaye *et al.*, 2012; Zaman *et al.*, 2016). Low consumption of FV is often simplistically attributed to unhealthy diets in developed countries and to

poverty and food insecurity in developing countries. In reality, barriers to adequate FV consumption differ greatly between countries or communities.

2.4 Global Situation of Non-communicable Diseases

Non communicable diseases predominate the global disease burden, disproportionately affecting low and lower-middle income countries (WHO, 2014); latest estimates suggest 82% of premature deaths attributed to NCDs are preventable through innovative interventions which are cost effective and achievable. However, CVDs, type II diabetes, cancer and chronic obstructive respiratory diseases were among most prevalent NCDs (WHO, 2014). This growing burden compounds stressed health systems, disproportionately affecting the poorest populations and hindering countries social and economic development (Islam *et al.*, 2014).

2.5 Ethiopian Situation of Non-communicable Diseases

The WHO in 2008 indicated that NCDs related annual death rate was 34% in Ethiopia (WHO, 2010a). In this report, CVDs accounted for 15%, cancers 4% and respiratory disease 4%, diabetes 2%, injuries 9% and other NCDs 9% of all causes of death. Indeed, nationally representative surveys on NCDs and their risk factors in Ethiopia are not available. However, a number of small-scale studies have reinforced the estimate above. For example, a study done in Addis Ababa investigated cause of death (51%) due to NCDs (Misganaw *et al.*, 2012). Another study done in this study area also showed that amongst the NCDs, CVDs was the leading cause of death (24%), followed by malignant neoplasms (10%); respiratory tract (9%) and diabetes (5%). Moreover, the study revealed disproportionate age specific death rates, with a significant rise in death from NCDs between the ages of 44 & 74 years. Another population based survey conducted in Jimma, Ethiopia showed that the overall prevalence of NCDs was 8.9%, and 3.1% for diabetes, 9.3% for hypertension, 3.0% for CVDs, 1.5% for asthma and 2.7% for mental illness (Ayalew *et al.*, 2012).

2.6 Consumption of Fruit and Vegetables and Non-communicable Diseases

The number of deaths attributed to a diet low in FV alone was estimated at 6.6 million (Lim *et al.*, 2010). The protective effects of FV in the diet may be because of their high content of vitamins, minerals and fiber, acting through mechanisms such as lowering blood pressure, reducing antioxidant stress and improving lipoprotein profile (US, 2015). A low intake of FV is associated with NCDs, CVDs, cancer and diabetes (Lim *et al.*, 2010). Most studies are conducted in Western countries, and little is known about the association between the intake of FV and NCDs risk factors in developing countries (Dauchet & Dallongeville, 2008).

Despite the extensive promotion of FV consumption, worldwide per capita consumption is estimated to be 20-50% short of the minimum daily recommended level of 400 grams per/day (CDC, 2011). Low intake of FV is among the top 10 risk factors for mortality in the world. According to the global burden of disease study, worldwide 3.4 and 1.8 million deaths can be attributed to low consumption of FV, respectively (GBDS, 2013).

2.7 Promotion of Fruits and Vegetables consumption

It is widely accepted that daily consumption of FV is important for human health and nutrition because the vitamins, minerals, essential micronutrients, fiber, vegetable proteins and bio-functional components they provide are crucial for human bodily function (FAO, 2015). The promotion of FV is often considered the so called low hanging fruit of nutrition interventions, because their intake can indicate the nutritional quality of diets.

The WHO estimates that if countries do not take decisive actions, by 2030 NCDs related deaths will increase to 50 million annually (WHO, 2016). Therefore, all regions in the world should ensure constant evaluation and monitoring of non-communicable diseases and their risk factors, with special attention being paid to poor and marginalized populations, such as migrant populations.

3. Conclusion

Fruit and vegetables are considered in dietary guidance because of their high concentrations of dietary fiber, vitamins, minerals and phytochemicals. Consumption of FV diet can protect against a number of serious and costly non-communicable diseases (NCDs), like cardiovascular disease (CVD), type II diabetes, some cancers, and obesity. Despite their numerous health benefits, developing countries including Ethiopia were not fulfilled 400g daily requirement for fruit and vegetables intake. In Ethiopia, low FV was consumed compared to other regions of the world and Ethiopia's per capita consumption of fresh fruits is also below the recommended minimum level of dietary intake. Consumption of FV is extremely suboptimal in Ethiopia. Efforts need to be strengthened to promote consumption of FV and overcome cost effective and preventable non-communicable diseases. Moreover, promotion of FV is likely to be more palatable economically to governments and the food industry than are interventions that restrict intake of unhealthy choices. Although the burden of non-communicable diseases in Ethiopia is also increasing, health systems and public health policies have been mostly

focused on controlling infectious and micronutrient deficiencies. This review identified that family income, lower paternal educational, poor nutritional knowledge and practice issues of fruit and vegetables were associated to low FV consumption. However, there are no adequate data at national level to identify barriers to low FV consumption. Therefore, nutrition education interventions should be strengthened by health extension workers and agricultural extension workers to increase the consumption of fruit and vegetables and to prevent non-communicable diseases (NCDs).

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