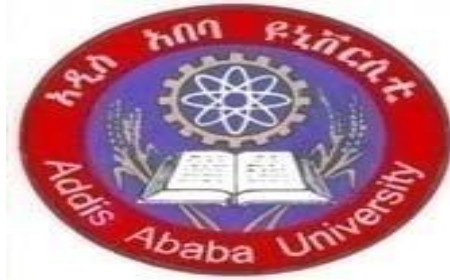


**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH**



**Association between diet and colorectal cancer in selected health facilities in Addis Ababa,
a case control study**

**A thesis submitted to the school of public health for the partial fulfillment of the requirement
for master's degree in public health, Addis Ababa university.**

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Acronyms

AARHB	Addis Ababa Regional Health Bureau
BMI	Body Mass Index
CVD	Cardiovascular Disease
CRC	Colorectal Cancer
FAO	Food and Agriculture Organization
KMO	Kesie-Myer Oklin test
NHANES	National health and nutritional examination survey
NGO	Non-Governmental organization
REC	Research Ethics Committee
TEM	Technical error of measurement
USDA	United states department of agriculture
WHO	World Health Organization

Summary

Background Colorectal cancer is the third most commonly diagnosed cancer in males and the second in females. In 2012 an estimated 1.4 million colorectal cancer cases and 693,900 deaths occurred worldwide. According to Addis Ababa cancer registry, the age-standardized rate per 100,000 for colorectal cancer is 8.1 in males and 7.6 in females. It has been estimated that dietary factors account for nearly half of all colorectal cancer cases. Diet and lifestyle factors are key intervention points in primary prevention. In Ethiopia, there have not been previous studies about the dietary patterns of colorectal cancer patients in Ethiopia.

Objectives- to identify the association between dietary patterns, nutrient intakes and colorectal cancer in Addis Ababa, Ethiopia.

Method-A matched case control study was conducted in 3 hospitals and 1 higher clinic which have cancer follow up center in Addis Ababa. A total of 88 cases and 264 controls were included in the study. Newly diagnosed cases and for each case 3 controls in the same hospital matched by age, sex and residence were selected. Semi quantitative food frequency questionnaire was used to assess the dietary pattern and to evaluate the dietary intake. we used factor analysis to identify dietary patterns. The data was entered to epi data and transfer to STATA 14.0. Nutrient content of food was calculated using nutrisurvey software. Residual method was used for energy adjustment. conditional logistic regression was used to identify the association of diet and colorectal cancer.

Result-Eight dietary patterns were extracted. After adjusting for confounding factors meat pattern which contains fried ox meat, fried sheep meat, and *kitfo* has significantly associated with increased risk of colorectal cancer(AOR=2.7;95%CI=1.20,6.22). Fish pattern which contains fried fish, tuna, and macchiato (AOR=0.01; 95%CI=0.002, 0.06) has decreased risk of colorectal cancer. There was no significant association between fruit pattern and colorectal cancer. Significant but weak protective association was also found for all macronutrients and fiber after adjusting by residual method.

Conclusion and recommendation- Consumption of meat and alcohol drinks increases the risk of colorectal cancer. Whereas fish, dairy products and refined cereals decreases the risk of colorectal

cancer. Further studies are recommended by using prospective study design and by addressing the limitations of this study.

1. Introduction

1.1 Background

Colorectal cancer (CRC) is a neoplastic process that starts in the colon or the rectum. Colon cancer and rectal cancer are often grouped together because they have many features in common. Most colorectal cancers arise from adenomatous polyp, which starts its growth in the inner lining of the colon or rectum. There are different types of colorectal cancers. These are adenocarcinomas, carcinoid tumors, gastrointestinal stromal tumors, lymphomas, and sarcomas; of these adenocarcinomas accounts 95% of all colorectal cancers. The signs and symptoms of colorectal cancers vary based on their anatomical positions. These are fatigue, palpitation, angina pectoris, blood loss in stool, abdominal cramping, occasional obstruction, and perforation(1, 2).

According to American cancer society the risk factors for colorectal cancer can be divided in to two; modifiable risk factors such as being overweight or obese, physical inactivity, diet, smoking, heavy alcohol use and the non-modifiable risk factors are age, personal history of colorectal polyp or cancer, personal history of inflammatory bowel disease, a family history of colorectal polyp or cancer, having an inherited syndrome, racial or ethnic background, type 2 diabetes (1, 2).

Dietary pattern summarizes the total diet or the key dietary components including food items, food groups, and nutrients, and may provide additional insights with the combined effects of many food components(3). It has been estimated that dietary factors account for nearly half of all colorectal cancer cases, and thus diet and lifestyle are important factors for the prevention of colorectal cancer(4). According to World Cancer Research Fund/American Institute for Cancer Research, red meat, processed meat, alcoholic drinks (men), body fatness, abdominal fatness, adult attained height are included in the highly associated factors that increases the risk of CRC where as physical activity is the highly associated factor that decrease the risk of CRC. On the other hand, foods containing dietary fiber, garlic, milk, and calcium probably decrease the risk of CRC and Alcoholic drinks in women probably increases the risk of CRC. There is limited evidence suggesting that non-starchy vegetables, fruits, foods containing folate, fish, foods containing vitamin D, and selenium and foods containing selenium protect against colorectal cancer, and that foods containing iron, cheese, foods containing animal fats, and foods containing sugars can be risk of this cancer. There is limited evidence about cereals (grains) and their products like; potatoes;

poultry; shellfish and other seafood; other dairy products; total fat; fatty acid composition; cholesterol; sugar (sucrose); coffee; tea; caffeine; total carbohydrate; starch; vitamin A; retinol; vitamin C; vitamin E; multivitamins; non-dairy sources of calcium; methionine; beta-carotene; alpha-carotene; lycopene; meal frequency; energy intake(5).

1.2 Statement of the problem

Colorectal cancer is the third most commonly diagnosed cancer in males and the second in females and fifth in Sab Saharan Africa, with an estimated 1.4 million cases and 693,900 deaths reported in 2012(6). CRC incidence and mortality rates are rising rapidly in many low-income and middle-income countries(7). It is estimated that over the next two decades the number of CRC cases will increase from 1.2 to 2.2 million worldwide, most of the increment (62%) will be in the developing countries(8). According to world health organization in Ethiopia the mortality rate of colorectal cancer in males is 11.2% and 4.8% in females(9).

According to a study conducted in Black Lion specialized hospital, the trend of colorectal cancer is increasing(10). The study reported 142 cases in just two years compared to previous study from the same institute which reported 131 cases over 5 years' time. According to Addis Ababa cancer registry the age standardized rate per 100,000 for colorectal cancer is 8.1 in males and 7.6 in females.

Dietary factors account for around 20% of the burden of cancer in developing countries(11). In one study, it was estimated that dietary factors contributed nearly 50% of all CRC cases diagnosed(12). According to American cancer society one of the risk factors of that can be changed to prevent colorectal cancer is diet. Most studies reported that avoiding red meat and processed meat and eating grains, cereals, fruits and vegetables may prevent colorectal cancer(13-15)

In Ethiopia there have not been any previous study about the association of dietary patterns and colorectal cancer. So this study will help us to evaluate the association between dietary pattern and colorectal cancer in Ethiopia.

1.3 Significance of the study

It has been demonstrated that diet significantly influences the risk of developing CRC, and up to 70% reduction in the cancer burden can be achieved by changing the food habits(16). As it's not previously studied in Ethiopia this study will give us information about the dietary factor and its association with colorectal cancer. Besides to this dietary factor can be associated with the recurrence of CRC after prognosis. So knowing about the dietary factor help the patients to improve their dietary habit accordingly even after treatment. Having good understanding about the dietary factors help the general public to choose the healthy diet for preventing colorectal cancer.

The result from this study will be used as a baseline data for health care givers and concerned bodies for further improvement of the nutritional counseling and intervention strategies which will be a great help in reducing prevalence of colorectal cancer and related morbidity and mortality.

2. Literature review

2.1 Prevalence of colorectal cancer

The estimated new cases of colorectal cancer in the world are 746,300 in males and 614,300 in females. Similarly, the estimated new cases in developed countries are 398,900 in males and 338,000 in females and in developing countries 347,400 in males and 276,300 in female. The incidence of colorectal cancer is 7.1% in males and 6.1% in females in eastern Africa in 2012(6). According to the Egypt National Cancer Registry, age-specific incidence rates of CRC per 100,000 were 6.3 for males and 4.3 for females(3) and also according to the Korean Central Cancer Registry, the age adjusted incidences of CRC were 51.4 per 100,000 for men and 28.0 per 100,000 for women in 2012(17). According to one study, from the total biopsies from Addis Ababa university pathology department 9.9% accounts for colorectal cancer(18). According to the study that is done by D. Zemenfes, B. Kottiso there were 142 case per 2 years. According to Addis Ababa cancer registry, there were 418 males and 389 female colorectal cases in 2012-2016. The incidence rate in Addis Ababa is 80 cases per year.

2.2 Dietary factors

Red meat

Extensive evidence suggests that long term consumption of red meat and processed meat may increase colorectal cancer risk(14, 15, 19-29). It can be related directly by consumption of red meat or indirectly which means high consumption of red meat might lead to low consumption of fruits, vegetables and fiber(30). A meta-analysis of 34 case control and 14 cohort studies found that high intake of red meat, and processed meat, was associated with significant increase in colorectal cancer risk with average RRs for the highest quintile of consumption of red meat were 1.35 and of processed meat. The RRs estimated by log-linear dose-response analysis were 1.24 for an increase of 120 g/day of red meat and 1.36 for 30 g/day of processed meat(27). The so called western diet which mostly contains energy dense and processed foods like meat, fatty or sugary foods, and processed meat which are highly associated with increased risk of colorectal cancer(5). Most case control studies revealed that red meat and processed meat which is included in the western pattern increases the risk of colorectal cancer(14, 15, 19-23). A systematic review also found similar conclusion, the Western dietary pattern which mainly consists of red and processed meat is associated with an elevated risk of development of CRC(31).

This may be explained by red meat and processed meat can increase the proportion of anaerobes in the gut microflora which leads to the conversion of normal bile acids into carcinogens. Diets which are high in animal fat also increased the risk by increasing the serum cholesterol level (1). Cooking methods also might have an effect on the formation of cancer. The risk could be through carcinogens like N-nitroso-compounds, polycyclic aromatic hydrocarbons, and heterocyclic aromatic amines that are produced during cooking, even if it is not specific for red meat only(24, 28).

In contrast there was no significant association with any of the types of meat cooked by any method and the risk of CRC in other case control study(32). Cross sectional study in Germany also found no significant association between red and processed meat and colorectal cancer(33). Although a recent comprehensive report from the world cancer research fund and American institute for cancer research suggested that red meat and processed meat as convincing risk factor for colorectal cancer(5, 25) , there is no conclusion about it.

Fish

High Fish consumption might decrease the risk of colorectal cancer in some case control studies(15, 34, 35). A meta-analysis also found that fish consumption decreased the risk of colorectal cancer by 12%(35). The inverse association could be attributed to less heme iron and high n-3 polyunsaturated fatty acid and vitamin D and A from fish(25, 29). It might be also because of the absence of N-glycolylneuraminic acid (Neu5Gc) which is responsible for the formation of oxygen reactive species. In contrast to this another case control study reported that fish consumption increased risk of colorectal cancer(23) .

Fruits and vegetables

High intake of vegetables, fruits, sea food and soya foods is shown to have statistically significant protective effect against distal colon cancer(14). Some Studies found out that intake of vegetables, and fruits decreased the risk of colorectal cancer(15, 21, 22). It may be because fruits, vegetables and whole grains are a good source of vitamins like vitamin A, C, E and fiber, minerals, selenium and carotenoids which can have the effect of binding and diluting carcinogens and also has anti-oxidant effect to change the physical environment in the colonic flora. Generally plant based diet is shown to decrease the risk of colorectal cancer(19). Consumption of orange/yellow, red/purple

and white vegetable and fruit groups are inversely associated with the risk of colorectal cancer in a Chinese population(36). Increasing fruit and vegetable consumption to decrease colorectal cancer risk may be most beneficial for those individuals who consume less than 2 servings/day of fruit and vegetable(37).

In contrast to this no association is found between the CRC development and consuming leafy vegetables (raw and cooked), tomato, and salad(38) and also a study done in Asia didn't get any association between fruits and soy legumes intake and colorectal cancer(22). A systematic review and meta-analysis on vegetable consumption and colorectal cancer association done on 6 cohort and 11 case control studies in Japanese population revealed no significant associations between vegetable consumption and colorectal cancer in cohort studies, whereas a weak inverse association was observed for case –control studies in Japanese population(39) Starch, vegetable protein and sodium have positive association with both colon and rectal cancer. But there is inverse relationship between Vitamins, fiber pattern and rectal cancer, between the unsaturated fats (animal source), the unsaturated fats (vegetable source) and cancer of the colon(40).

Milk and milk products

Milk and milk products like cheese, yogurt contains high proportion of energy from fat and from protein. The fat content of the milk and milk products might have an effect on the association of colorectal cancer and dairy products. They also contain vitamins like retinol and riboflavin and minerals like calcium(5). Some case control studies found that consumption of milk and milk products have protective effect on colorectal cancer(19, 29). The mechanism could be due to calcium, riboflavin, vitamin B12, vitamin D and also other protective substances such as butyric acid, linoleic acid, sphingomyelin content of milk and milk products(29). Calcium has protective effect on colorectal cancer. Individuals with calcium intake lower than 700-1000mg/day has increased risk of colorectal cancer(41). It is may be calcium has protective role against inflammation and bile acid irritation on the colon wall. So calcium in colonic epithelial cells may decrease cancer promoting inflammatory responses(41). But some studies also found no significant association between milk and milk products and colorectal cancer(42, 43).

Grains and pulse

A meta-analysis of twenty five prospective studies reported that an inverse association between whole grains and colorectal cancer risk (44). Another case control study also found similar inverse association but not for refined grains. Refined grains increased the risk of colorectal cancer in some case control studies. Because when grains refined the important parts like brans and germs are removed which have fiber and other protective nutrients(29, 31). Similar study also find legumes has positive association with colorectal cancer(29).

Other foods

one or more cups of herbal tea per week was associated with decreased risk of distal colon cancer and consumption of 1 or more cups of iced coffee per week was associated with increased risk of colorectal cancer. But both are not associated with proximal colon cancer. Black tea (with or without milk), green tea, decaffeinated coffee, and milk were not significantly associated with colorectal cancer risk(42). A combined result from 25 case control studies revealed that the risk of colorectal and colon cancer for the highest coffee drinkers was approximately 15 % and 21 % lower than for the lowest/nondrinkers, respectively(45).

Macronutrients

Protein and Carbohydrate

A recent meta-analysis on dietary carbohydrate intake reported that higher dietary carbohydrate intake may be an increased factor for colorectal cancer risk in men populations but not in women(46). Similar to this a case control study found that significantly increased risk of colorectal cancer with an increase of starch intake(43). It is known that carbohydrate yield a considerable amounts of calorie through metabolic reactions and also dietary carbohydrate intake is the main dietary component affecting an individual's insulin secretion and glycemic response(46, 47). So high intake of carbohydrate may increase the insulin level and leads to hyperinsulinemia and consecutive insulin resistance that considered as a risk factor for cancer development(46, 47). on the other hand, a case control study found no significant association with starch intake and colorectal cancer(48).

A case control study done in 2017 reported that protein intake has no significant association with colorectal cancer(49). Similar case control studies found no significant difference, between CRC cases and controls regarding their daily intake of protein(48, 50). But another similar study suggests that the risk of colorectal cancer moderately decrease with an increase of protein intake(43).

Fat

Macronutrients such as saturated fat and cholesterol has increased effect on CRC(51, 52) and also the association of fat with CRC depends on the type of fat. Monounsaturated and Polyunsaturated fat intake reduce the risk of colon cancer however the intake of saturated fatty acid has significant association with the risk of rectal cancer(52). There is a hypothesis that consumption of high fat increases the risk of colorectal cancer. It might be because high fat intake results high caloric intake and obesity and this can cause hormonal changes that can over activate the re-generation of colonic endothelial cells and encourage the growth of polyps and adenomas. It can also stimulate colorectal cancer risk through its altered immunologic responses and insulin resistance(29). The protection of unsaturated fatty acid might be because of the presence of double bonds. Several studies reported that the association of fat intake and colorectal cancer depends on the source of fat and the type of fat(29, 43, 51, 52).

Fiber

Fiber can be classified in to soluble and insoluble fiber. According to food sources fiber can be also classified in to fruit and vegetable fiber, cereal fiber and so on. Bran fiber is more insoluble and fruit and vegetable fiber are more soluble(30). A meta-analysis reported that a high intake of dietary fiber in particular cereal fiber was associated with a reduced risk of colorectal cancer(44). Protection effect of dietary fiber also supported by another case control study. It proposes that vegetable fiber and total fiber play very important roles in protecting against colorectal cancer and also soluble and insoluble fibers were inversely associated with only colon cancer and colorectal cancer(53). Most studies also found inverse association with colorectal cancer and fiber intake(30, 44, 53). In contrast to this a case control study done in Saudi Arabia found that no significant difference, between CRC cases and controls regarding their daily intake of dietary fiber(50). the protective mechanism could be due to that fiber can increase stool bulk, dilute fecal carcinogens, shorten fecal transit time and reduce the contact of carcinogens with the colon epithelium. Fiber

can also be fermented by gut flora to short chain fatty acid like butyrate which is a short chain fatty acids in the human colon that has the ability to inhibit carcinogenesis. Some studies reported that high in fat and meat intake might disturb the integrity of colonic cells. In the other way cell wall constituents like suberin and lignin which are found in skins of potato and wheat bran absorb heterocyclic amines and thus protect against colorectal cancer(30, 53).

Energy

Most studies found out that total energy intake increased the risk of colorectal cancer(19, 23, 29, 31, 43, 54). The mechanism could be like increased energy intake could be responsible for the glycemic overload and a compensatory increase of serum insulin and related insulin growth factor-1 which is a promoter of tumor cell growth in vitro may expose colonic and rectal cells to a proliferative stimulus(48). The other mechanism could be high energy intake leads to overweight and obesity and this can lead to cancer development in different ways(43). A case control study found direct significant association with total energy intake and colorectal cancer. A comprehensive report from the world cancer research fund and American institute for cancer research determined that total energy intake has no simple relationship with colorectal cancer risk, but its effect may be dependent on other factors, such as physical activity(25, 54).

2.3 Other factors

There are some factors other than diet that affect colorectal cancer development. These are body mass index (BMI), family history, smoking, alcohol drinking, antibiotics, previous history of CRC and inherited syndromes like lynch syndrome, familial adenomatous polyposis, hyperplastic polyposis, hamartomatous polyposis conditions and Familial Adenomatous Polyposis(55).

Body mass index

BMI was positively associated with colorectal cancer(19, 21). One of the hypotheses for obesity and colorectal cancer association is hyperinsulinemia and insulin resistance. A nested case control study found that individuals with normal insulin level and overweight are at lower risk of colorectal cancer risk than those hyperinsulinemia and also normal weight individuals with hyperinsulinemia are at higher risk of colorectal cancer than normal weight individuals with normal insulin level(56). The other mechanism might be its association to a condition of chronic inflammation described by

abnormal production of inflammatory cytokines that can affect both tumor initiation and tumor progression(57).

Smoking and Alcohol drinking

A meta-analysis of Twenty seven cohort and thirty four case control studies offers strong evidence for an association between alcohol drinking of >1 drink per day and colorectal cancer(58). Higher Alcohol consumption particularly >30g/day was associated with and higher risk of colon cancer(59). Its association was stronger among those who have positive family history of colorectal cancer(59). This might be because of acetaldehyde a toxic metabolite which is found by oxidation of ethanol that can be carcinogenic for colon cells(25) . On the other mechanism excess intake of ethanol can induce oxidative stress via high production of reactive oxygen species which are genotoxic and carcinogenic(25, 60).

Most studies show that cigarette smoking increased the risk of colorectal cancer(15, 19). In a case control study the risk increases in males and alcohol drinkers(61). Another study done in women population found that high risk in colon cancer and also showed risk for rectal cancer(62). In contrast other studies revealed that Smoking and alcohol drinking were not associated with increased risk(23, 63).

Inherited syndromes, Family history of colorectal cancer and previous history of colorectal cancer

Inheritance is a common factor and about one third of cases revealed a moderately penetrant form of inherited predisposition, while 3% to 5% of cases occur as rare but highly penetrant syndrome of colon cancer. The risk increases with two first degree relatives with colon cancer or a first degree relative who has been diagnosed under the age of 50 years(64).

Family history had significant increase in colorectal cancer risk(22). Similarly, other study found that family history of colon cancer is the most significant factor that associated with increased risk of CRC with odds ratio 1.17(50).

Another case control study done on risk factor for colorectal cancer for young onset are family history of colorectal cancer in first-degree relatives, higher association with affected siblings, >14drinks/a week of alcohol drinks, and processed meat(65).

Previous history of CRC is another factor. The rate of recurrence in stage two CRC patients with in five years is 10% and in stage three patients 30%. Most of the recurrence occurs within the first two years after surgery in both stages(66). The recurrence can be associated with dietary pattern of the patients. The western dietary pattern which includes red meat, processed meat, and other energy dense foods has increased risk towards recurrence but the prudent dietary pattern which includes fruits, vegetables and whole grains has no significant association with the recurrence(67).

3. Objectives

3.1 General objective

- To identify the relationship of diet with colorectal cancer in selected health facilities in Addis Ababa, Ethiopia.

3.2 Specific objectives

- To assess the association of dietary pattern and colorectal cancer in selected health facilities in Addis Ababa, Ethiopia.
- To identify the association of protein, carbohydrate, fat, fiber, energy intake and colorectal cancer in selected health facilities in Addis Ababa, Ethiopia.

4. Methods

4.1 Study area

The study was conducted in Addis Ababa, which is the capital of Ethiopia. According to central statistics agency the population of Addis Ababa is 3,384,569 in 2016.

AARHB is responsible to coordinate the overall health care activities of the city. Under its administration there are 6 hospitals. There are also 10 sub-city health offices, which are directly accountable to their respective sub-city administration. There are 52 hospitals in the metropolis of which 6 are owned by AARHB, 5 by federal government, 3 by NGO's, 3 by Defense force and police and 35 by the private owners. There are also more than 760 private clinics at different levels. As a result, the potential health service coverage measured in geographical accessibility in Addis is about 100%.

The Addis Ababa cancer registry is the first population based cancer registry in the country which was established in September 2011 at Radiotherapy Center, Black Lion Specialized Hospital, School of Medicine and Addis Ababa University. The registry collects data from 20 institutions that are found in Addis Ababa city every 15 days. According to Addis Ababa cancer registry, 418 males and 389 female patients were registered for colorectal cancer in 2012-2016.

4.2 Study design and period

Individual matched case control study was conducted from March 2017– December 2017. We conducted this study in the selected public and private hospitals in Addis Ababa namely, Tikur Anbesa Specialized Hospital, St. Paul Hospital, Betezata Hospital and United Vision Higher Clinic.

4.3 Population

4.3.1 Study population

Newly diagnosed CRC patients who came to the selected hospitals and higher clinics at the time of data collection.

Cases: were defined as patients who were newly diagnosed in the past six months with colorectal cancer using biopsy of colon or rectum and whose age is greater than 20.

Controls: were defined as patients with the similar age group (within 5-year interval), sex and residence as cases. They were admitted to surgical and orthopedics ward of the same hospital for acute conditions such as fracture, joint dislocation, acute osteomyelitis, septic arthritis, wound infection, simple goiter, hernia and whose age is greater than 20. United vision higher clinic didn't have surgical or orthopedics ward. So we choose the controls from their outpatient department.

4.4 Sample size determination

We determined sample size using epi info version 7 with the assumptions of; power 80%, 95% confidence interval and control to case ratio of 3:1 based on similar study done in Iran and Jordan for all objectives (29,51). The highest sample size was taken and 10% non-response rate was added. The final sample size was 88 cases and 264 controls.

Table 1 sample size calculation

Patterns	Power	CI	Percent of controls exposed	Ratio of control to case	Percent of cases with exposure	N for controls	N for cases	Total N
Healthy dietary pattern	80%	95%	45.8%	3	73.2	114	38	152
Western dietary pattern	80%	95%	38.7%	3	60.2	240	80	320
Protein	80%	95%	19.3%	3	46.4	101	34	135
carbohydrate	80%	95%	25%	3	44.4	200	67	267
Fat/saturated	80%	95%	20.5%	3	57.4	60	20	80
Fiber	80%	95%	25.4%	3	9.3	205	69	274
Energy	80%	95%	22.5%	3	43	175	59	234

4.5 Sampling procedure

According to Addis Ababa cancer registry 20 health institutions have cancer center in Addis Ababa. Among these, health institutions which have fifteen and greater than fifteen case per year

were selected. Newly diagnosed consecutive colorectal cancer cases in Tikur anbesa specialized Hospital, St Paul Hospital, Betezata Hospital, United Vision Higher Clinic were enrolled until the required sample size were obtained. For each case, three controls were selected based on the matching criteria which are sex, age group and residence. They were selected with similar sex, 5-year age group and matched residence (by region and village status whether it is rural or urban) at the time of data collection at the same hospital at the same time.

4.6 Data collection procedure

We developed a questionnaire containing sociodemographic section, health profile section, anthropometric section and semi quantitative food frequency questionnaire. The socio demographic section contains age, sex, religion, ethnicity, marital status, educational status, occupation, and household income. The health profile section contains time of diagnosis, family history of CRC, and smoking history. The anthropometric section contains height and weight measurement. The data were collected by 8 data collectors and 2 supervisors from each hospital by using semi quantitative food frequency questionnaire.

4.6.1 Dietary data

We adapted and modified the format of the food frequency questionnaire from willets FFQ and NHANES food frequency questionnaire. The list of food items in the semi quantitative FFQ was taken and modified from the previous study which is done in Addis Ababa(68). We also conducted a 24-hr dietary recall at Tikur Anbesa specialized hospital on 20 patients that are found in outpatient department and which were not included in this study. The aim of the 24-hr recall was to modify the food frequency questionnaire based on the common food types colorectal cancer patients ate. The FFQ constituted 70 food types divided in to 9 groups including cereals, legumes, roots and tubers, fruits, vegetables, meat and fish, milk and milk products, sweets and beverages and fast foods. Each food group contains different number of food items. These are 14 items of cereal, 5 items of legumes, 6 items of roots, and tubers, 7 items of fruits, 8 items of vegetables, 3 items of sweets,9 items of meat, 6 items of dairy products, 12 items of beverages and fast foods. Cases were asked to recall their usual frequency of intake over the last one year before the diagnosis. controls were asked to recall their usual frequency of intake over the last one year. The participants were asked to choose the frequency of intake from the choices (never,2 or more times

a day, once a day,5-6 times weekly,3-4 times weekly,2 times weekly, once in a week,2-3 times in a month, once in a month,7-11 in a year,1-6 times a year) for each food item.

4.6.2 Portion size estimation

The portion size estimation was done by using common utensils used around Addis Ababa e.g. tea spoons, cups, and plates. Color photograph pictures were prepared for different amounts of food in grams. All the foods were measured with the common utensils used for that particular food and was weighed for each utensil assigned for the food types. Then photograph model was prepared for estimation and was given for the data collectors. The photograph model was prepared in small, average and large amounts for each food item. The participants were asked to remember their usual portion size from the photograph model which have a choice of small, average and large amount for each food item.

4.6.3 Anthropometric measurement

Anthropometric measure was taken from subjects using standard measurement scales.

Height was measured using height wooden Stadiometer with sliding head bar, without shoes, standing erect with shoulder blades, buttocks and heels touching measuring board, looking straight ahead, shoulders relaxed, arms at sides, legs straight and knees together, feet flat and with heels almost together. The data collectors took measurement with an assistant who make sure that the occiput, the shoulder blades, buttocks and heels touches the measuring board while the data collector reads and writes the measurement.

Weight was measured by weighing scale to the nearest 0.1kg. The weighing scale was placed on flat and hard surface and the respondents were measured with minimal clothing and without shoe. The calibration of the weighing scale was checked before every measurement.

Body mass index (BMI) was calculated as weight in kilograms and height in meter square and was classified according to world health organization classification for adults.

4.7 Variables

4.7.1 Dependent variable

- Colorectal cancer; cancer of the colon or the rectum which is confirmed by biopsy.

4.7.2 Independent variables

- Dietary pattern; Quantities, proportions, variety or combination of different foods and drinks in diets and the frequency with which they are habitually consumed.
- Dietary nutrient intake; Intake of protein in g, carbohydrate in g, fat in g, fiber in g and energy in k/Cal

4.7.3 Covariate variables

- Sociodemographic characteristic; Age, sex, educational status, marital status, occupational status, income
- Health profile; time of diagnosis, family history of CRC, alcohol intake, and smoking.
- Anthropometry; BMI

4.7.4 Exclusion criteria

patients with history of chronic disease such as diabetes mellitus, hypertension and patients with dietary restriction like cholesterol, salt were excluded because it might have effect on their dietary habit. We also excluded patients who are critically sick at the time of data collection and patients who can't stand to measure height and weight.

4.8 Data analysis procedure

We checked the data for completeness and coded according to its match. We entered the data in to EPI data and transferred to Stata 14.0 statistical software packages for data cleaning and analysis. Frequencies and summary statistics (mean, standard deviation, and percentage) were used to describe the study population in relation to relevant variables. Any errors identified at this time were corrected after revision of the original data using the code numbers. Missing values were excluded during analysis. Frequencies and measures of variation described the study population in relation to socio demographic and other relevant variables. We used WHO anthro plus software to calculate BMI.

4.8.1 Dietary pattern

We used factor analysis to identify dietary patterns. Factors were rotated by varimax rotation procedure for better interpretation and to assess correlation of components. Factors were retained based on factor eigenvalue greater than 1. The patterns were labeled based on each food item having the highest loading on each pattern. Individual food items with a factor loading of $> |0.35|$ are highlighted as composing that factor for simplicity. A factor score was calculated for each dietary pattern (factor) by assigning loading matrix to each participant, indicating the extent to which their diet corresponded to that pattern. This means an individual with a higher factor score has a stronger adherence to that pattern. Factor scores were then categorized into tertiles. The factor scores which is divided into tertiles were named as low, intermediate and high consumption of that pattern. The lowest tertile were taken as reference.

4.8.2 Nutrient intake

Calculating nutrient content of foods

The nutrient value of each food item per 100g was taken from Ethiopian food composition table for food items included in this study. For foods that are not included in Ethiopian food composition table such as pasta, macaroni, beetroot, green beans, tuna, jam, pizza, burger, rice, peanut butter, Mirinda, coca cola, sprite, beer and wine USDA borrowed food composition table and Tanzania food composition table was used.

After preparation of food composition table, the nutrient values of each food was entered to nutrisurvey software to create dietary data base. The portion size of food items which are presented in different amounts in the photograph model was converted to grams in order to calculate the nutrient intake of each individuals. Intake of each food item in grams was then determined by multiplying the portion size by frequency of consumption. We found daily consumption of each food item in gram, by dividing the product of portion size and frequency of consumption by seven for weekly frequencies, by thirty for monthly frequencies and by three hundred sixty-five for yearly frequencies. We entered daily consumption of each food item in gram for each individual nutrisurvey software and converted to amount of nutrient and energy intake per individual per day. Then individual's nutrient intake was export to excel and imported to Stata to analyze the association. Total energy intake was estimated by adding the energy value of each food in the FFQ.

Protein, carbohydrate, fat and fiber intake was estimated by adding the nutrient value of each food in the FFQ. The mean intake of energy, protein, carbohydrate, fat and fiber was calculated.

Nutrient residual (energy-adjusted) model

Total energy intake is associated with disease risk due to the relationship with physical activity, body size or metabolic efficiency. Intake of most nutrients are tend to be positively correlated with total energy intake especially macronutrients. It is either because they contribute directly to energy intake or because individuals who consume more total energy also eat on average more of all specific nutrients. So because of this correlation we couldn't know the relevant factor whether it is absolute (crude) nutrient intake which is confounded by total energy intake or the nutrient by itself, if we couldn't consider controlling total energy intake. So to control effect of total energy intake, nutrient residual model was used. In this model the absolute nutrient intake was regressed on the total energy intake. The residuals from the regression represent the difference between each individual's actual intake and the intake predicted by their total energy intake. So the nutrient residuals are uncorrelated with total energy intake and this permits the variation due to the nutrient composition of the diet to be assessed directly(70). Finally, the residuals were taken as energy adjusted nutrient intake. The absolute and energy adjusted nutrient intake were divided in to tertiles and named low, medium and high consumption of nutrients. The lowest consumption was taken as reference

4.8.3 Diet and colorectal cancer

Conditional logistic regression analysis was used to identify association of diet and colorectal cancer. The effect of age, sex and residence were not included in the analysis. P value <0.05 was considered to declare statistical significant associations. Odds ratio were calculated with 95% confidence interval and adjusted for potential confounders. Finally, the data is reduced and presented using appropriate tables and text description as needed.

4.9 Data quality management

The data collectors and supervisor were trained for four days about the objective of the study, how to conduct the interview, how to estimate the portion size and how to measure height and weight. Things were explained well by using different methods like role play.

After the theory of anthropometric measurement explained data collectors were exercised height and weight measurement by measuring each other. Then intra and inter observer technical error of measurement (TEM) was calculated. Intra observer TEM for height and weight was 0.5 and 0.3 respectively. The inter observer TEM for height and weight were 0.6 and 0.4. So additional training was not given because the TEM was in the acceptable range.

Pilot testing of the questionnaire was done to know the understandability of the questions on the study participants at Tikur Anbesa specialized hospital and St. Paul hospital but not included in the study. The questionnaire was prepared in English language and translated to Amharic language. After data collection the questionnaire was checked for completeness. The supervisor and the investigator were follow closely the process.

4.10 Ethical consideration

Ethical clearance was obtained from Addis Ababa University School of Public Health REC. Permission to conduct the study was also obtained from the hospitals. Consent was obtained from the participants, after the necessary explanation about the purpose, benefits and risks of the study and also their right on decision of participating in the study. Confidentiality of the information was maintained throughout the study by excluding names as identification in the data extraction form and the data was used only for the purpose of the proposed study. The participants were asked for a little bit longer time and they might be tired and also had a little discomfort when measuring height and weight but there will not be any invasive procedure.

4.11 Dissemination of results

Result will be presented and submitted to Addis Ababa University School of Public Health, Addis Ababa cancer registry, American cancer society, Addis Ababa ministry of health and to different workshops and Publication on peer reviewed journals.

5. Result

5.1 Socio demographic variables

A total of 352 subjects (88 cases and 264 controls) were interviewed with a 100% response rate. The cases and controls were matched by sex, age and residence. Five-year age interval was used for age matching. we use similar region and similar status of the place where they came from whether it is rural or urban for residence matching. The mean age of participants was 48.7years (± 14.3) for males and 45.6 years (± 14.9) for females. Among 352 subjects, 220 (62.5%) were males and 132 (37.5%) were females. Among 352 participants (26.1%), (28.4%), (30.7%), (2.3%), (10.2%) and (2.3%) were from Addis Ababa, Amara, Oromia, Tigray SNNPR and Harar regions respectively. Of all subjects (28.4%) were from rural and (71.6%) were from urban area. We found a significant difference in BMI among cases and controls. Case tend to be more overweight than controls ($p=0.001$). Due to high missing value income was not included in the analysis. But there was not significant difference in other sociodemographic characteristics.

Table 2 socio demographic characteristics of cases and controls in public and private hospitals in Addis Ababa,2017

Variables	Case (n, %)	Control (n, %)	p-value
Religion			0.32
Muslim	16(18.1)	73(27.7)	
Orthodox	62(70.5)	153(57.9)	
Protestant	10(11.4)	38(14.4)	
Marital status			0.34
Currently unmarried	21(23.9)	52(19.7)	
Currently married	67(76.1)	212(80.3)	
Ethnicity			0.66
Gurage	6(6.8)	17(6.4)	
Tigre	3(3.4)	11(4.2)	
Amhara	39(44.3)	113(42.8)	
Oromo	35(39.8)	102(38.3)	
other	5(5.7)	22(8.3)	
Educational status			0.14
Can't read and write	13(14.8)	32(12.1)	
Can read and write	28(31.8)	74(28.0)	
Primary school	15(17.1)	45(17.1)	
Secondary school	24(27.2)	91(34.5)	
Collage and above	8(9.1)	22(8.3)	
Occupational status			0.36
Farmer	13(14.8)	43(16.3)	

Government employee	13(14.8)	46(17.5)	
Merchant	21(23.8)	66(25)	
Private employee	14(15.9)	42(15.9)	
House wife	24(27.3)	46(17.4)	
Unemployed	3(3.4)	21(7.9)	
Body mass index			
<18.0	5(5.7)	17(6.5)	
18.0-24.9	56(63.6)	212(80.3)	
25.0-30.0	22(25)	29(10.9)	
>30.0	1(1.1)	0(0.00)	
Missing	4(4.6)	6(2.3)	

p<0.01, *p<0.001 n case=88 and n controls=264

5.2 Health profile variables

All cases and controls had no family history of colorectal cancer. Among cases, only 2 had a history of smoking in their life time. All cases were not smoking cigarettes currently. Among controls only 2 subjects had a history of smoking in their life time. Only one subject was currently smoking.

5.3 Dietary habit

We used factor analysis to identify dietary patterns of study subjects. The Kesie-Myer Oklin test (KMO test) was done to evaluate the suitability of factor analysis and sampling adequacy. Out of 70 food types used in the FFQ, 2 food items were excluded from the factor analysis due to affirmative response from all subjects. These were *shiro wot* (a sauce made from grass pea flour (roasted) and chili and sunflower extract and salt). The other was *sigawot* (sauce of meat, onion, oil, pepper, and salt). Similarly, 2 food items (peanut butter and jam) were also excluded due to negative response (say no) from all subjects.

Table 3 shows the factor loadings of eight major dietary patterns which is derived using exploratory factor analysis. Foods with factor loading greater than the absolute value of 0.35 were assumed to have greater contribution for that pattern was highlighted in table 3.

Table 3. Factor loadings of the eight dietary patterns identified in colorectal cancer patients using a factor analysis

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
Pasta	0.80	-0.004	0.07	0.03	0.01	-0.02	0.08	0.05
Macaroni	0.80	0.01	0.11	-0.03	-0.02	-0.03	0.07	0.04
Rice	0.38	-0.14	0.27	0.02	-0.17	-0.04	0.07	-0.08
<i>Chechebsa</i>	0.14	-0.18	0.01	-0.02	-0.32	0.08	-0.01	0.04
<i>Ye gebs kolo</i>	0.03	0.11	0.02	0.68	0.002	0.05	0.02	-0.02
<i>Ye gebs dabo</i>	-0.05	0.18	-0.02	0.17	0.69	-0.04	0.1	0.07
Potato Chips	0.28	-0.06	0.13	-0.02	0.05	-0.001	0.08	0.07
Green beans	0.02	0.02	0.11	0.08	0.45	-0.06	0.16	0.04
Green pepper	-0.02	0.10	0.14	0.66	0.04	-0.06	0.09	0.08
<i>Bakela ashuk</i>	0.0004	0.17	0.03	0.63	0.28	-0.05	-0.01	0.15
Avocado	0.10	-0.09	0.70	0.03	0.02	0.03	0.08	-0.03
Mango	0.12	-0.05	0.67	0.12	-0.02	-0.02	0.04	0.07
Orange	0.17	0.10	0.27	0.08	0.24	0.01	0.05	0.12
Pine apple	0.14	-0.01	0.51	0.01	0.01	0.10	0.11	0.04
Papaya	0.20	0.10	0.42	0.11	0.12	0.01	0.11	0.01
Lemon	0.0008	0.17	0.05	0.29	0.10	0.05	0.13	0.05
<i>Kitfo</i>	0.13	0.06	0.04	0.007	0.11	0.02	0.14	0.39
Fried ox meat	0.07	0.06	0.03	0.21	0.12	0.04	-0.001	0.54
Fried sheep meat	0.16	-0.008	0.07	0.19	0.06	0.05	-0.01	0.51
Tuna	0.25	0.13	0.12	0.06	0.11	-0.09	0.60	0.01
Fish roasted	0.18	0.06	0.26	0.11	0.14	0.05	0.53	0.05
Cow milk	-0.02	-0.05	0.001	-0.05	0.06	0.74	-0.02	0.05

Yogurt	-0.00	-0.02	0.04	-0.02	-0.06	0.78	0.01	-0.01
Cheese	-0.07	-0.05	-0.005	0.08	-0.05	0.62	-0.02	0.01
Fried egg	0.42	-0.01	0.01	0.07	-0.06	-0.07	0.10	0.08
Honey	0.08	0.20	0.15	0.21	0.38	0.09	0.06	0.007
Mirinda	0.03	-0.28	0.18	-0.03	-0.01	0.09	-0.006	0.01
Sprite	0.26	-0.05	0.09	0.02	-0.11	0.02	0.07	0.03
Macchiato	0.33	0.08	0.06	0.01	0.02	0.05	0.40	-0.10
Beer	0.04	0.78	0.05	0.06	0.12	-0.08	0.09	-0.05
<i>Tela</i>	-0.07	0.70	-0.13	0.11	-0.06	0.02	-0.10	0.05
Mead	-0.007	0.78	-0.06	0.08	0.09	0.006	0.05	0.05
Wine	0.12	0.47	0.12	-0.01	0.05	-0.20	0.24	0.07

Table 4 shows the labeling of the factors based on food items which have high loading for that factor. The first factor labeled as refined cereals pattern is characterized by high loading for pasta, macaroni, rice, fried egg. The second factor labeled as alcohol drinks are characterized by high loading for beer, *tella* (Local alcoholic beverage made with millet and other ingredients), mead and wine. The third factor named as fruits are characterized by high loading for avocado, mango, pineapple, and papaya. The fourth factor labeled as pulse, grain and green pepper is characterized by high loading for roasted barely, green pepper, *bakela ashuk* (Brad beans whole, dried, roasted and boiled). The fifth factor named as grain, sweet and green bean is characterized by high loading for barely bread, green beans, and honey. The six factor labeled as dairy products are characterized by high loading for milk, yogurt, and cheese. The seventh factor named as fish is characterized by high loading for tuna, fish, and macchiato. The eighth factor labeled as meat pattern is characterized by high loading for fried sheep meat, fried ox meat, *kitfo* (raw minced beef with butter and chili). (Table 4)

Table 4. Dietary patterns that are extracted from factor analysis and their composition and labeling in public and private hospitals in Addis Ababa,2017

Factor	Composition	Label
Factor 1	Pasta, macaroni, rice and fried egg	Refined Cereal
Factor 2	Beer, mead , <i>tella</i> , wine	Alcohol drinks
Factor 3	Avocado, mango, pineapple, papaya	Fruits
Factor 4	Roasted barely, green pepper , <i>bakela ashuk</i>	Pulse, grain and green pepper
Factor 5	Barley bread, green beans, honey	Grain, sweet and green beans
Factor 6	Cow milk, yoghurt ,cheese	Dairy
Factor 7	fried fish, tuna, macchiato	Fish
Factor 8	Fried ox meat ,fried sheep meat, <i>kitfo</i>	Meat

Table 5 shows description of selected food items that have high loadings and their description. Some food items like green pepper, raw ox meat and *kitfo* were eaten raw. But some food items were eaten cooked as stew, fried, or roasted. Their description includes what ingredient they contain and how they are cooked.

Table 5. Food items with high factor loadings and their description

Food items	Description
Pasta	Pasta cooked with tomato sauce
Macaroni	Macaroni cooked with tomato sauce
Rice	Rice cooked with tomato sauce
Fried egg	Fried egg with oil.
Barely roasted	Roasted barely
Green pepper	Raw green pepper
Barely bread	Barely bread
<i>Bakela ashuk</i>	Brad beans whole ,dried, roasted and boiled
<i>Kitfo</i>	Raw minced beef with butter and chili
Fried ox meat	Beef fried with fat

Raw ox meat	Raw beef
Fried sheep meat	sheep meat fried with fat
<i>Tella</i>	Local alcoholic beverage made with millet and other ingredients
Mead	Local alcoholic beverage made with honey

Table 6 presents the ORs and their 95% CIs for colorectal cancer by tertiles of factor scores for each dietary pattern. After adjusting for potential confounders such as BMI, total energy intake, marital status, occupational status, educational status the higher risk of CRC was associated with meat pattern (the highest vs. the lowest tertiles: AOR=2.7; 95% CI:1.20, 6.22).

In addition to this of alcohol drinks pattern (the medium vs. the lowest AOR=4.0; 95% CI:1.32, 12.58). Grain, green pepper and pulse pattern (the medium vs. the lowest AOR=3.9; 95% CI:1.59, 9.94) has higher risk of colorectal cancer. The highest consumption of alcohol drinks pattern (the highest vs. the lowest tertiles AOR=2.5; 95% CI: 0.91,7.03) and Grain, green pepper and pulse pattern (the highest vs. the lowest tertiles AOR=1.5; 95% CI:0.60,3.83) were associated with higher risk of colorectal cancer but it was not significant.

The fish pattern was inversely related to the risk of CRC (the highest vs. the lowest tertile: AOR;0.01; 95% CI:0.002, 0.06). Dairy pattern (the medium vs. the lowest AOR=0.1; 95% CI:0.03, 0.27) has decreased risk of colorectal cancer. Refined cereal pattern also (the medium vs. the lowest tertiles: AOR=0.2; 95%CI:0.09,0.82) has decreased risk of colorectal cancer.

We didn't find significant association between fruit pattern and colorectal cancer (AOR=0.4; 95% CI:0.16, 1.02). moreover, significant association was not found between grain, sweet and green beans pattern and colorectal cancer (AOR=1.004; 95% CI:0.41, 2.41).

Table 6. Odds ratios and 95% CI of colorectal cancer according to eight dietary patterns in colorectal cancer patient in public and private hospitals in Addis Ababa,2017

Dietary pattern	Degree of Consumption		
	First tertile(low)	Second tertile(Medium)	Third tertile(High)
		AOR(95%CI)	AOR(95%CI)
Refined cereals	1	0.2(0.09,0.82)*	3.1(1.008,10.14)
Alcohol drinks	1	4.0(1.32,12.58)*	2.5(0.91,7.03)
Fruits	1	2.0(0.91,4.53)	0.4(0.16,1.02)
Grain, Pulse and green pepper	1	3.9(1.56,9.94)**	1.5(0.60,3.83)
Grain , sweet and green beans	1	0.5(0.23,1.27)	1.004(0.41,2.41)
Dairy	1	0.1(0.03,0.27)***	0.5(0.20,1.31)
Fish	1	0.07(0.02,0.23)***	0.01(0.002,0.06)***
Meat	1	1.8(0.78,4.55)	2.7(1.20,6.22)*

Adjusted for marital status, occupational status, educational status, BMI

*p<0.05, **p<0.01, ***P<0.001

AOR=adjusted odds ratio

5.4 Macronutrient intake and CRC risk

We used energy adjusted intake than the absolute intake in the regression model. We employed the residual method to get the energy adjusted intake for macronutrients under investigation. this was done by linear regression of the absolute nutrient intake on total energy intake. Participants with reported energy intake <500 and >4000 kcal/day was excluded for this analysis.

Table 7 shows the mean daily intake of total energy intake, macronutrients and fiber in cases and controls. Controls reported significantly higher intake of total energy intake, protein intake, carbohydrate intake, fat intake and fiber intake than cases (p<0.05).

Table 7 Mean intakes of total energy, macronutrients, and fiber among cases and controls in public and private hospitals of Addis Ababa,2017

	Intake of total energy and macronutrients	Case(n=83)	Control(n=225)	Difference(case-control)
Absolute nutrient intake	Total energy(kcal/day)*	2337.08±792.32	2632.52±729.78	-295.44
	Protein*	86.95±30.04	102.30±37.39	-15.35
	Carbohydrate*	401.78±136.31	440.47±116.19	-38.69
	Fat*	50.77±22.30	58.35±21.45	-7.58
	Fiber*	40.60±17.91	51.41±20.30	-10.81
Energy adjusted nutrient intake	Protein*	88.95±33.83	101.56±31.76	-12.61
	Carbohydrate*	396.39±123.53	442.45±113.78	-46.06
	Fat*	50.97±19.58	58.27±18.03	-7.3
	Fiber*	44.44±14.91	50.00±13.73	-5.56

*significant differences between cases and controls

^aall contentious variables presented as mean ±SD (standard deviation)

Table 8 gives the OR and 95% CI of colorectal cancer according to tertile intakes of total energy intake, absolute and energy adjusted macronutrients. After adjusting potential confounders for both the absolute nutrient intake and energy adjusted nutrient intake, a significant decreased risk was observed with increasing of total energy intake (AOR=0.2, in the highest versus lowest tertile of intake 95% CI: 0.1-0.6). CRC risk was also inversely related to intake of absolute nutrient intake of protein, carbohydrate, fat and fiber [AOR=0.3; 95% CI: (0.14, 0.70), AOR=0.3; 95% CI: (0.15, 0.70), AOR=0.3; 95% CI: (0.14, 0.67), AOR=0.2; 95% CI: (0.09, 0.46)] respectively. Similarly, significant decreased risk of colorectal cancer was observed with an increasing of energy adjusted intakes of protein, carbohydrate, fat and fiber [AOR=0.2; 95% CI :(0.13, 0.64)].

Table 8. Associations (adjusted OR, 95%CI) of total energy, macronutrients, and fiber intakes with CRC risk, public and private hospitals in Addis Ababa,2017

Absolute nutrient intake	Intake of macronutrients and energy and fiber	Degree of consumption		
		First tertile (Low)	Second tertile (Medium)	Third tertile (high)
Total energy intake				
	No of case/control	38/65	26/77	19/83
	Median intake(kcal/day)	1742.9	2547.49	3360.86

	AOR ^a (95% CI)	1	0.3(0.1,0.8)*	0.2(0.1,0.6)*
	Protein			
	No of case/control	34/69	29/74	20/82
	Median intake(g/day)	58.04	97.62	135.86
	AOR ^a (95% CI)	1	0.5(0.2,1.1)*	0.3(0.14,0.70)*
	Carbohydrate			
	No of case/control	39/64	21/82	23/79
	Median intake(g/day)	298.8	427.58	564.65
	AOR ^a (95% CI)	1	0.2(0.13,0.62)*	0.3(0.15,0.70)*
	Fat			
	No of case/control	39/64	23/80	21/81
	Median intake(g/day)	33.92	54.66	81.04
	AOR ^a (95% CI)	1	0.3(0.17,0.77)*	0.3(0.14,0.67)*
	Fiber			
	No of case/control	43/60	25/78	15/87
	Median intake(g/day)	29.18	45.41	67.11
	AOR ^a (95% CI)	1	0.4(0.21,0.83)*	0.2(0.09,0.46)*
Energy adjusted nutrient intake	Protein			
	No of case/control	38/65	26/77	19/83
	Median intake (g/day)	63.57	97.93	132.66
	AOR ^a (95% CI)	1	0.3(0.18,0.82)*	0.2(0.13,0.64)*
	Carbohydrate			
	No of case/control	38/65	26/77	19/83
	Median intake(g/day)	303.75	429.19	556.01
	AOR ^a (95% CI)	1	0.3(0.18,0.82)*	0.2(0.13,0.64)*
	Fat			
	No of case/control	38/65	26/77	19/83
	Median intake(g/day)	36.29	56.17	76.27
	AOR ^a (95% CI)	1	0.3(0.18,0.82)*	0.2(0.13,0.64)*
	Fiber			

	No of case/control	38/65	26/77	20/83
	Median intake(g/day)	33.25	48.40	63.71
	AOR ^a (95% CI)	1	0.3(0.18,0.82)*	0.2(0.13,0.64)*

^a adjusted for BMI, total energy intake marital status, occupational status, educational status

*significant difference from reference category (p<0.05)

6. Discussion

This was individual matched case control study to assess the dietary patterns and nutrient intake of colorectal cancer patients and its association with the colorectal cancer in three hospitals and one higher clinic. We enrolled 88 cases and 264 controls in this study. Eight dietary patterns were derived by using factor analysis. High intake of “meat” pattern and moderate intake of “grain, pulse and green pepper” pattern and “alcohol drinks” pattern was associated in increasing colorectal cancer risk. High intake of “Fish” and moderate intake of “dairy” and “refined cereal” pattern was associated in decreasing colorectal cancer risk. There was no significant association with fruit pattern and colorectal cancer. By using residual method for energy adjustment, it was found that fiber, protein, carbohydrate and fat were associated with decreased risk of colorectal cancer.

It was found that “meat” pattern has significant association with colorectal cancer in our study which is comparable with other studies. A cohort study in US found similar result regarding meat consumption(26). In this cohort study long term red meat consumption may increase the risk of colorectal cancer in the distal part of large intestine(26). Another meta-analysis study in which 15 case control and 9 cohort studies investigated that significant increased risk of colorectal cancer with higher levels of red meat intake(27). The effect can be explained by formation of N-nitroso-compounds, polycyclic aromatic hydrocarbons, heterocyclic aromatic amines, heme iron and reactive oxygen species, abnormal gut functioning and the role of gut bacteria(24).

Cooking of red meat with high temperature increase the formation of N-nitroso-compounds, polycyclic aromatic hydrocarbons and heterocyclic aromatic amines which are carcinogenic chemicals that can help for the development of colorectal cancer(5, 24, 28, 29). In the other way the carcinogen called N-nitroso-compounds can be formed by the reaction between nitrogen oxides and secondary amines in the stomach(5, 24). Human studies showed that a urinary markers of exposure to N-nitroso compounds are associated with micronucleus frequencies which is a validated marker of carcinogenic risk, as well as with gene expression changes that are involved in cancer development(5, 24).

The other mechanism might be through heme iron. Red meat contains heme iron which is responsible for the color of red meat. Heme iron may catalyze the formation of the carcinogenic

chemicals like n-nitroso-compounds. It may also promote the carcinogenesis through increased cell proliferation by inducing lipid oxidation. The heme and the cell surface sialic acid N-glycolylneuraminic acid (Neu5Gc) which are found in red meat that can help for the formation of reactive oxygen species which can disrupt the normal cell proliferation of gut epithelial cells resulting increased risk in cancer(24).

On the contrary other case control study found no association between meat consumption and colorectal cancer(32). This might be because of different study population. A meta-analysis of 27 cohort studies describes the association of red meat consumption and colorectal cancer in terms of weak association and lack of clear dose response rate(34).

In this study “Fish” pattern has significant protective effect of colorectal cancer. This finding is similar with other studies(15, 34, 35). A meta-analysis of 22 prospective and 19 case control studies found that fish consumption decrease the risk of colorectal cancer by as much as 12%(35). They also found that the protective effect is more prominent for rectal cancer than colon cancer and this might be because of different characteristics of colon and rectum tissue and origin of the colorectal cancer(35).The protective effect of fish might be because of small amounts of heme iron absence of N-glycolylneuraminic acid (Neu5Gc) which is responsible for the formation of reactive oxygen species. It might be also as fish is a good source of omega-3 fatty acids and high level of omega-3 fatty acid has been associated with lower cell proliferation, increased apoptosis, possible limited tumor angiogenesis(24). In the contrary a case control study in South India found that consumption of fish has increased risk of colorectal cancer. This might be due to difference in type of fish consumed, amount of fish consumed, method of cooking and method of preservation(23).

Consumption of dairy (milk and milk products) found to be protective from colorectal cancer in other studies(19, 29). We also found similar result. This could be explained by the presence of some micronutrients like riboflavin, calcium, vitamin B12 and vitamin D in dairy. As the same time dairy also contained other substances which can protect from cancer like butyric acid, linoleic acid, sphingomyelin and probiotic(29).

It is found that refined cereals pattern has decreased risk of colorectal cancer. In this study this pattern contains food items like pasta, macaroni, rice and fried egg. However, other case control study found that refined grains has increased risk to colorectal cancer than whole grains (5, 19, 29). It might be because refined grains retain only endosperm but whole grain contains germ and

bran which have various substances with anti-cancer properties, including fiber, antioxidants and phytochemicals (5, 29, 71). A case control study in south India also found that consumption of egg has increased risk of colorectal cancer (23)

In this study fruit pattern does not have significant association with colorectal cancer. Similar result was found in other case control studies(22, 23, 53). Most studies found out that fruit consumption has reduced risk of colorectal cancer(19, 29). This might be because of this food are a good source of micronutrients that can help for binding and dilution of carcinogens and anti-oxidant effects(19, 29). The discrepancy between this study and other studies could be due to diet which contains high amount of meat or dairy or cereals might decrease the consumption of fruits.

Overweight and obesity is one of the factors for colorectal cancer and this study also found increasing risk in overweight and colorectal cancer. This can be explained by chronic inflammation of gut micro biota can promote colorectal cancer development. High levels of adipokines and insulin like growth factor-1 promote cell growth and inhibit apoptosis might be the link between overweight and cancer(24, 25).

It was found that moderate intake of alcohol drinks pattern increases the risk of colorectal cancer. The mechanism can be explained by alcohol intake may be the cause of folic acid deficiency in colon and rectum by folate malabsorption. As we know folate is needed for the synthesis of certain DNA bases and to methylate DNA structure. This deficiency of folate might increase the risk of DNA hypomethylation, DNA mutations and strand breaks which can increase the development of colorectal cancer. The other mechanism can be via intestinal bacteria which can oxidize ethanol in the colon and rectum and generate high level of acetaldehyde that can initiate or promote cancer(60). Our finding on increasing risk of alcohol consumption was similar with other studies. However, this study found significant association on moderate intake of alcohol consumption and other studies also found significant association on high intake of alcohol drinks(58, 60, 72).

Dietary intake of fiber had reduced risk of colorectal cancer. This could be due to fiber can increase stool bulk and dilute fecal carcinogens. This shortens fecal transit time and reduce the contact of carcinogens with the colon epithelium in large intestine. The other mechanism could be due to fiber can bind to the carcinogens like bile acid and can be fermented by gut flora to short chain fatty acids like butyrate that can prevent carcinogenesis(53). The result in this study are consistent with other studies(30, 53).

We found inverse association between macro nutrients such as protein, carbohydrate, fat and colorectal cancer. The protective effect of protein and carbohydrate is consistent with other studies in Italy and Canada (43, 54). We also found protective association with fish and dairy products which are non-meat protein. It might be because of high intakes of methionine may contribute to DNA methylation which seems to be important to prevent colon cancer(54). In the contrary other study found no association between protein, carbohydrate and colorectal cancer(49, 50,48)). However, other studies found increased risk about protein intake, carbohydrate and colorectal cancer(51, 52,19, 43)

The association of fat and colorectal cancer depends on the type of fat(48, 52). Polyunsaturated fat, monounsaturated fatty acid and omega 3 polyunsaturated fatty acid reduced the risk of colorectal cancer(47, 52). It might because MUFA had double bond that is important to lower the opportunity of oxidation and prevent colorectal cancer(47). In the other way saturated fatty acids and cholesterol intake has increased risk of colorectal cancer(51, 52). Most studies found increasing risk of fat intake and colorectal cancer. But in our study it was found that fat intake had protective association with colorectal cancer. The discrepancy might be due to the different types of fatty acids because we didn't see the association of different types of fat and its association with colorectal cancer risk.

We also found significant protective association between total energy intake and colorectal cancer in this study. Most studies found total energy intake increased risk for colorectal cancer development(19, 23, 54). Increased energy intake could be responsible for the glycemic overload and a compensatory increase of serum insulin and related insulin growth factor-1 which is a promoter of tumor cell growth in vitro may expose colonic and rectal cells to a proliferative stimulus(48). But our finding is not consistent with other findings.

8. Limitation of the study

This study has its own limitations. The first is recall bias; since participants were asked their exposure before diagnosis, differential recall between cases and controls could bias the result. The cases might recall their diets better than controls because of their disease. But to solve this problem we tried to show the participants a photograph to remind them the portion size and the food item. We also tried to include patients with diagnosis of cancer not more than 6 months.

Since semi quantitative FFQ was used to assess the dietary intake of participants in the past one year, it is likely to have measurement error such as difficulties in recalling consumed items, under-reporting or over-reporting about some or total number of food items or nutrients and social desirability bias is also one undeniable limitation of this study.

The other limitation was the variable physical activity was not included to avoid the tiresomeness of the questionnaire.

Moreover, due to commonality of consumption of *siga wot* and *shiro wot* in both groups was excluded as it may have affected the findings. The other limitation could be not knowing the onset of sign and symptoms of CRC and pathologic diagnosis (lead time bias) which might affect their dietary habit.

In addition to these, since the screening test for controls are difficult due to different reasons (being expensive), we didn't confirm that controls are free from colorectal cancer. We only choose controls based on their history. The other is there is no gold standard way to determine the number of factors that needs to be included in factor analysis, we used factor analysis and loading factor 0.35 was taken which is subjective and it can have left out the food groups that needs to be included analysis. Validation of the semi quantitative food frequency should have been done but it was not done due to time constraints.

The other limitation might be the health facilities included in this studies are selected based on the information that we get from Addis Ababa cancer registry which collects data only from Addis Ababa residents.

9. Conclusion

In conclusion this study revealed that diets that are characterized by high intake fried meat, and *kitfo* (labelled as meat pattern) was significantly associated with increased risk of colorectal cancer. At the same time moderate intake of “alcohol drink” pattern has increased risk of colorectal cancer. Being overweight also had significantly increased risk of colorectal cancer. On the other hand, high intake of “fish” pattern which contains fish, tuna, macchiato, moderate intake of milk, yogurt, cheese (labelled as dairy pattern) and moderate intake of past, macaroni, rice, fried egg (labelled as “refined cereal” pattern) has significant protective association with colorectal cancer. Significant association was not found between fruit pattern and colorectal cancer. After adjusting energy by residual method dietary intake of protein, carbohydrate, fat and fiber has significant protective association even if it is weak. Findings from this research can be used to support dietary guidelines for colorectal cancer prevention.

10. Recommendation

Peoples could prevent colorectal cancer by improving their dietary habit and by maintaining their weight. We recommend individuals to consume more fish, milk products, cereals and foods containing fiber, to decrease their consumption of meat, alcohol drinks and to maintain their weight. Clinicians shall be supported with nutritionists in order to provide nutrition counseling and support for patients.

By using this study as base line, further studies are recommended on the diet and colorectal cancer association by addressing the limitation of this study such as by including physical activity and by using validated food frequency questionnaire.

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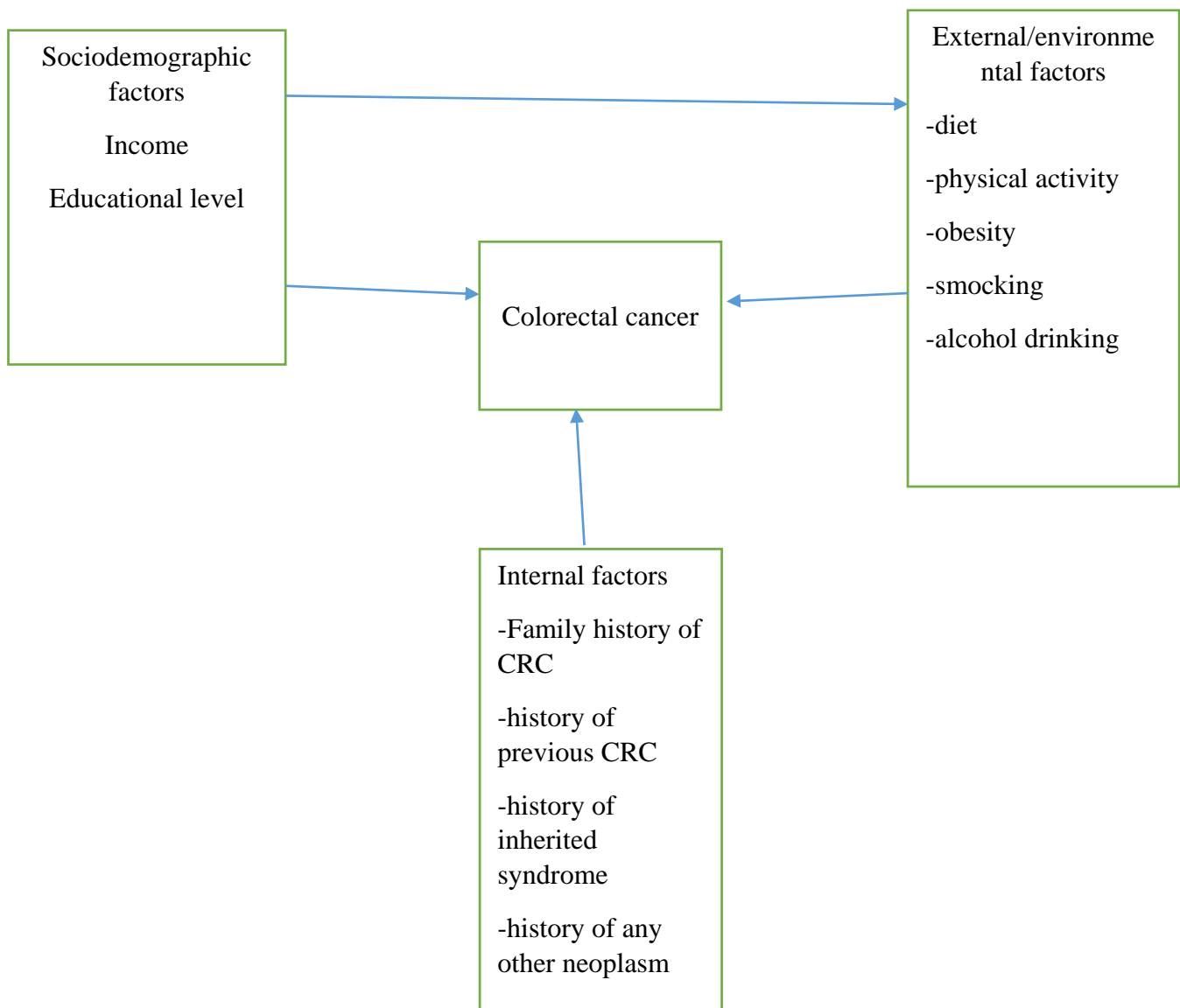
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10. Annexes

10.1 Annex one- Conceptual framework

According to different literatures there are different factors associated with the risk of colorectal cancer. These are the internal factors that we cannot change and the external/environmental factors that we can change. Dietary factor is one of the external factors that affect colorectal cancer development.



10.2 annex two -macronutrients and colorectal cancer by conditional logistic regression

Odds ratio and 95%CI of colorectal cancer by absolute and energy adjusted macro nutrients in colorectal cancer patients by conditional logistic regression

	macronutrients	AOR (CI=95%)
Absolute nutrient intake	Protein	0.97(0.96,0.98)***
	Carbohydrate	0.99(0.99,0.99)**
	Fat	0.98(0.96,0.99)**
	Fiber	0.96(0.95,0.98)***
	energy	0.99(0.99,0.99)***
Energy adjusted nutrient intake by residual method	Protein	0.98(0.97, 0.99)***
	Carbohydrate	0.99(0.99,0.99)***
	Fat	0.97(0.96,0.98)***
	Fiber	0.97(0.95,0.98)***

Adjusted for marital status, occupational status, educational status and BMI

*p<0.05, **p<0.01, ***p<0.001

AOR=adjusted odds ratio

10.2 Annex three Participant Information Sheet

Dear Participants

My name is I am here on the behalf of Betelhem Zewdneh who is a master's student in Addis Ababa university school of public health in department of nutrition. She is working her thesis on dietary pattern and colorectal cancer and she received permission from the university and the hospitals.

This letter serves to ask consent from you to take part in this research. The purpose of this research is to identify the dietary patterns of colorectal cancer patients and its association with colorectal cancer.. This study will be helpful to know which dietary habit can cause colorectal cancer and will help us to avoid such food types and to follow healthy diet. It will also serve as provide some information to researchers who are voluntary to conduct further research in similar areas in the country.

Your participation in this research is voluntary. If you decide not to participate there will be no negative consequences for you. If you decide to participate there will be no benefits for you. However your participation on this study is very important for achievement of the study. There will not any risk occurring to you because of your participation in this study. All the responses given by you and results obtained will be kept confidential using coding system whereby no one will have access to your response. You are not expected to give your name or phone number. Without permission from you and legal body, any part of this study will not be disclosed to third person. You have full right to refuse and withdraw from the participation at any time if you don't wish to continue. We hope you will participate in the study for the sake of the benefit of the research result. If you are willing to participate in this study, please sign the agreement form.

Address: Cell phone +251918042998

Email: bettizewd@gmai.com

Questionnaires ID_____

10.3 Annex four Informed Consent Form

Based on the understanding of the information, are you willing to participate in this study?

A) Yes

B) No

(1) If yes, I will continue a

2) if no I will skip to next participant after writing the reasons of refusal.

Respondent

Signature _____ Date _____

Interviewer

Name _____ Signature _____

Questionnaires number _____

Date of interview _____ Starting time _____ Completed _____

Result of interview A) Completed

B) Not completed

C) Partially completed

D) Refused

Checked by Supervisor: Name _____ Signature _____

Address: Cell phone +251918042998

Email: bettizewd@gmail.com

Instruction: circle all the possible answers of the respondent from the choice provided.

10.4 Annex five - English version Questionnaires

Part 1 -Socio demographic

On this section of the questionnaire I will ask you few questions about your socioeconomic status and you will choose one or more choices from the answers

No	Questions	Responses	Skip
101	Age in completed years	-----year	
102	Sex	Male1 Female2	
103	What is your religion?	Muslim.....1 Orthodox.....2 Protestant3 Catholic.....4 Others5	
104	What is your marital status?	single.....1 married2 Widowed.....3 Divorced..... 4 Separated.....5	
105	What is your Ethnicity?	Oromo1 Tigray.....2 Amhara.....3 Guarage.....4 Others (Specify).....5	
106	Have you ever attended school	Yes.....1 No.....2	→ Q107
107	What is your Educational level?	Can read and write.....1 Primary school2	

		Secondary school.....3 College graduate or above4	
108	What is your occupation? (multiple answer is possible)	Farmer1 Government employee.....2 Merchant3 Private organization employee4 Daily laborer5 House wife6 Other.....7	
109	personal income per month	

Part 2 Health profile questions

On this part of the questionnaire I will ask you few questions about the health profile and I will ask you to choose one or more answers from the choices

201	How long has it been since you diagnosed with CRC?	_____ weeks	
202	Has any one of your family member diagnosed with CRC?	Yes.....1 No.....2	
203	Which one of your family member diagnosed with CRC?	_____	
204	Have you ever smoke cigarettes?	Yes.....1 No.....2	→ Q212
205	How many cigarettes do you smoke per day?	_____	
206	Have you smoke cigarettes currently?	Yes.....1 No.....2	
207	How many cigarettes do you smoke per day?	_____	

Part 4 –semi quantitative food frequency questionnaire

Instruction –Dear respondent please take few moment to memorize the food and drinks you ate 24 months before the diagnosis of CRC and I will say the food items if you consume the food type you will tell me how often and how much you ate .To help you estimate the portion size I will show photographs

	Food types N.B–the respondent s must be asked if they ate each food type listed	Did you eat ----- in the last 2 years		How much of ---- ----did you eat in the previous 2 years		2 or more* a day	Daily	5-6 *weekl y (write the exact number)	3-4*a week (write the exact numbe r)	2*wee kly (write the exact numbe r)	One 's a wee k	2-3 * a mont h(writ e the exact numb er)	Once a mont h	7-11* a year(write the exact numb er)	1-6* a year(writ e the exact number)
		1 yes	0 no (write only the code)	Photo code /number	Frequ ency										
	Cereals														
1	<i>Teff key enjera</i>			Write in no or <i>kurit</i>											

2	<i>Teff nech enjera</i>		”												
3	<i>Enjera firfir</i>														
4	<i>Gebis tikur dabo</i>		Piece												
5	<i>Ambasha</i>		Piece												
6	<i>Nech sinde dabo</i>		Piece												
7	<i>Yeaja atmit</i>														
8	Pasta														
9	Macaroni														
10	Rice														
11	<i>Chechebisa</i>														
12	<i>Nech gebis genifo</i>														
13	<i>Chiko</i>														
14	<i>yegebs kolo</i>														
15	<i>Yeaj kiche</i>														
	Roots														

16	fried Potato (<i>dinich tibs</i>)																
17	boiled potato (<i>Dinich kivil</i>)																
18	Potato wot (<i>Dinich wot</i>)																
19	Carrot																
20	<i>Key sir</i>																
21	<i>Kocho</i>																
	Vegetables																
22	Cabbage (<i>Tikil gomen kivil</i>)																
23	Kale boiled (<i>tikur gomen</i>)																

24	Lettuce (<i>selata</i>)														
25	<i>Kosta</i>														
26	Tomato raw kurit														
27	Tomato Sause														
28	<i>Fosoliya</i>														
29	<i>Kariya</i>														
	Legumes														
30	<i>Mitin Shiro</i> <i>wet</i>														
31	<i>Bakela</i> <i>Ashuk</i>														
32	<i>Ater kik wet</i>														
33	<i>Misir kik</i> <i>wot</i>														
34	Peanut butter														
	Fruits														
35	Avocado		In number												

36	Banana		”												
37	Mango		”												
38	Orange		”												
39	Pineapple		”												
40	Papaya														
41	Lemon		”												
	Meat														
42	<i>Kitfo</i>														
43	<i>Siga wet</i>														
44	Ox meat roasted (<i>ye bere tibs</i>)														
45	Raw ox meat (<i>tire siga</i>)														
46	Sheep meat roasted (<i>yebeg tibs</i>)														
47	Goat roasted (<i>yefiyel tibs</i>)														

48	Tuna														
49	Fish fried														
	Dairy fats and egg														
50	Cow Milk														
51	yoghurt														
52	Cottage cheese (Ayib)														
53	Egg whole boiled		In number												
54	Egg fried		In number												
55	butter														
	Sweets														
56	Honey														
57	Sugar														
58	Jams(<i>marmarat</i>)														
	Beverage and Fast foods														

59	Mirinda														
60	Coca cola														
61	Sprite														
62	Tea														
63	Coffee														
64	Macchiato														
65	Beer														
66	<i>Tella</i>														
67	<i>Tej</i>														
68	Wine														
69	Pizza		In number												
70	Burger		In number												

አዲስ አበባ ዩኒቨርሲቲ

ህብረተሰብ ጤና ሳይንስ

ጠቅላይ /መላሾች መረጃ ቅን

እንደምን አፍ/ሰራ፡- ስሜ----- ይባላል። ከህ የመጣሁት የአባል አበባ ዩኒቨርሲቲ የህብረተሰብ ጤና ሳይንስ ሁለተኛ ስምንተኛ ተማሪ ሆነችሁን ቤቴሌሔም ስምትነህ ስም ነው። የሁለተኛ ስም የመመረቁዎ ቆይቷን በአባል አበባ ከተማ በሚገኙ ህንጻ ህምና በሚሰጥባቸው የመንግስትና ህል ሆስፒታሎችና ሊኒኮች ላይ አንጀት ካንሰርና አመፋጸን ሁኔታን ፅንኑነት በሚመሰክት ለማድረግ ከአባል አበባ ዩኒቨርሲቲ እና ከሆስፒታሎች ቃት አግኝታ በመስፈት ሳይ ተገኝሰች ።

እርስዎ የተመረጡት በህ ሆስፒታል አንጀት ካንሰር ህምና በማትረፍ- ነ። ህ ዓናት አላማም የአመጋገብ ሁኔታንና አንጀት ካንሰርን ፅንኑነት ለማወቅ ነ። ህም ዓናት የየትኛው አይነት አመጋገብ ለአንጀትካንሰር አንጻራዊ ለማቅና ለወደፊትም ቅትጠ ዓንቃቁ ለማትረፍ ይረዳል።ከዚህም በተጨማሪ ለሌሎች በተመሳሳይ ነገር ላይ ጥናት ማድረግ ለሚፈልጉ አጥኚዎች መረጃ ለመስጠት ያገለግላል።

እርስዎ ተሳትፎ ሙሉ-በሙሉ በእርስዎ ፈቃደኝነት ላይ የተመሰረተው።በዓናቱ መሳተክና ያለመሳተፍ መብት አለዎት። ለመሳተፍ ፈቃደኛ ከሆኑ በኋላ በሚፈልጉት ጊዜ ማቋረጥ ወይም ማቆም ይችላሉ።በጥናቱ ባለመሳተፍ- ሚሰርስዎት ምንም አይነት ችግር አሳርም። በጥናቱ ለመሳተፍ ከተስማሙ ስለ አመጋገብ- አስከ 30 ደቂቃ ሊወሰድ የሚችሉ ጠቅላይ ጥያቄዎችን እንጠቅቃለን።

ለማንኛውም አይነት ጥያቄ ዋና አጥኝውን ማነጋገር ይችላሉ።

ጥያቄ ቁጥር 0918 04 29 98

የስምምነት መጠየቂያ/ማረጋገጫ ቅፅ

ከላይ በሠጠሁት መረጃ መሰረት በዚህ ጥናት ላይ ለመሳተፍ ፈቃደኛ ነዎት?

1. አዎ 2. አይደለሁም

ቃጠኛ ካልሆኑ ምንጭን ንግግር ማቀዳ ለግብር ተሳተፎ ሊሆን ይችላል።

የመጻፍ ቁጥር	
የማህደር ቁጥር	
መጻፍ ቤት አድራሻ	
የሥራ ቤት ስም	
መጻፍ የተጀመረበት ሰዓት	
መጻፍ የተጠናቀቀበት ሰዓት	

ቁጥር ስም _____ ኝርምር _____

ቀን _____

ተቆጣጣሪ ስም _____ ኝርምር _____

ቀን _____

የቃለመጥያቄ ውጤት

1. ሙሉ በሙሉ ተሞላ

2. በከፊል ተሞላ

3. ምንም ያልተሞላ

ለማንኛውም አይነት ጥያቄ ዋና አጥኝውን ማከጋገር ይችላሉ

ሞባይል 0918 04 29 98

ትእዛዝ ተሳታፊዎች የሚሰጡትን ማንኛውንም መልስ ከተሰጡት አማራጮች ውስጥ ለይተው አክብቡ

ክፍል 1-ማህበረሰባዊ ጥያቄዎች

ከዚህ በመቀጠል ስለ እራስዎና ቤተሰብዎ ባህሪዎች አስመልክቶ የተወሰኑ ጥያቄዎችን እጠይቀዎታለሁ።

ተቁ	ጥያቄ	ምላሽ	የሚዘለል
		----- በዓመት	
101	እድሜዎስንትነው?		
102	ፆታ	ወንድ 1 ሴት 2	
103	የመጡበት አካባቢ ስም	-----	
104	የመጡበት አካባቢ ሁኔታ	ገጠር -----1 ከተማ -----2	
105	የየትኛው ሀይማኖት ተከታይ ነዎት?	ሙስሊም.....1 ኦርቶዶክስ..... 2 ፕሮቴስታንት..... 3 ካቶሊክ..... 4 የሌላ(ይገለጹ).....5	
106	የጋብቻ ሁኔታ?	ያላገባ.....1 ያገባ.....2 የሞተበት.....3 የፈታ.....4 ተለያይቶ የሚኖር5	
107	ብሄርዎት ምንድን ነው?	ጉራጌ 1 ትግሬ. 2 አማራ 3 አሮሞ 4 ሌላ (ይገለጹ). 5	
108	የትምህርት ደረጃ?	መፃፍና ማንበብ የማይችል1 መፃፍና ማንበብ የሚችል.....2 አንደ ኛደረጃ 3 ሁለተኛ ደረጃና ከዛብ ላይ4 ከኮሌጅ በላይ 5	
109	የስራሁኔታ (ከአንድ በላይ መልስ መስጠት ይቻላል)	አርሶ አደር (ገበሬ) 1 የመንግስት ሰራተኛ 2 ነጋዴ 3 የግልድ ርጅት ሰራተኛ 4	

		የቀን ሰራተኛ. 5 የቤት እመቤት 6 ሌላ (ይገለጽ). 7	
110	ወርሃዊገቢዎን ያክልኑ? (የግልገቢዎን ይግለጹ)		
111	ክብደት	-----ኪ.ግ	
112	ቁመት	-----ሴ.ሜ	

ክፍል 2 - ስለጤና ሁኔታ

ከዚህ በመቀጠል ስለ ጤናዎት ሁኔታ አንዳንድ ጥያቄዎችን እጠይቅዎታለሁ፡፡

ከማንበሎት ምርጫ ውስጥ ይገልጹልኛል፡፡

ተ.ቁ	ጥያቄ	ምላሽ	የሚዘለል
201	የአንጀት ካንሠር ከያዘዎት ምን ያክል ጊዜ ሆነዎት?	----- በሳምንት	
202	ከቤተሰብዎ ውስጥ የአንጀት ካንሠር ተይዞ የነበረ ሠው አለ?	አለ-----1 የለም-----2 →	ወደ 204
203	የአንጀት ካንሰር ይዞት ከነበረው የቤተሰብዎ አባል ጋር ያለዎት ዝምድና ምንድን ነው?		
204	ሲጋራ አጭሰው ያውቀሉ?	አዎ----- 1 አላጨስም----- 2 →	ወደ 206
205	በቀን ምን ያክል ሲጋራ ያጨሱ ነበር?	-----	
206	በአሁኑ ሰዓት ሲጋራ ያጨሳሉ?	አዎ----- 1 አላጨስም----- 2	

207	በቀን ምን ያህል ስጋ ለውጥ ይኖራል?	-----	
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ክፍል 4 -የዘውትር የአመጋገብ ሁኔታና የምግብ መጠን የሚያሳይ መጠይቅ

ከዚህ በመቀጠል በሚገኛው የምግብ ዝርዝር ከያዘው ሠንጠረዥ ውስጥ በ 1 አመት ውስጥ የተመገቡትን የምግብ አይነት ለትንሽ ደቂቃ አስበው የሠወዱት የምግብ አይነት ካለ በምን ያህል ጊዜ እና መጠን እንደወሰዱ በማሳያዎት የፎቶ መረጃዎች በመታገዝ ይገልጹልኛል።

	የምግብአይነትከዚህ በታችየተዘረዘሩትምግቦችበ1አመትውስጥመመገባቸውንይጠይቁ።	400 A	400 B		በቀን ከ 2-3 ጊዜ (ቁጥሩን ይጻፉ)	በቀን አንዴ (ቁጥሩን ይጻፉ)	5-6 * በሳምንት (ቁጥሩን ይጻፉ)	3-4 * በሳምንት (ቁጥሩን ይጻፉ)	2 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	1 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	2-3 በወር (ቁጥሩን ይጻፉ)	1 ጊዜ በወር (ቁጥሩን ይጻፉ)	7-11 *በአመት (ቁጥሩን ይጻፉ)	1-6 *በአመት (ቁጥሩን ይጻፉ)	
		1አመትውስጥተመገቡ	ፎቶኮድ	ድግግ ሞ											
	የእህልዘር														
1	ቀይጤፍእንጀራ														
2	ነጭጤፍእንጀራ														
3	እንጀራ-ፍርፍር														
4	የአጃቅንጨፍ														
5	አምባሻ														
6	ነጭየስንዴዳቦ														
7	የአጃቅአጥሚት														
8	ፓስታ														
9	ማካሮኒ														
10	ሩዝ														
11	ጨጨብሳ														
12	ነጭግብስገንፎ														
13	ጭኮ														

14	የገብስቆሎ													
	የምግብ አይነት ከዚህ ህበታች የተዘረዘሩት ምግቦች በ1 አመት ውስጥ መመገባቸውን ይጠይቁ፡፡	400 A ባለፈው 1 አመት ውስጥ ተመግቦ ውያውቃል	400 B አንዴ ሲመገቡ ምን ያክል ይመገባሉ?	በቀን ከ 2-3 ጊዜ (ቁጥር ናን ይጻፉ)	በቀን አንዴ (ቁጥር ናን ይጻፉ)	5-6 * በሳምንት (ቁጥር ናን ይጻፉ)	3-4 * በሳምንት (ቁጥር ናን ይጻፉ)	2 ጊዜ በሳምንት (ቁጥር ናን ይጻፉ)	1 ጊዜ በሳምንት (ቁጥር ናን ይጻፉ)	2-3 በወር (ቁጥር ናን ይጻፉ)	1 ጊዜ በወር (ቁጥር ናን ይጻፉ)	7-11 * በአመት (ቁጥር ናን ይጻፉ)	1-6 * በአመት (ቁጥር ናን ይጻፉ)	
		1. አዎ 2. አልተመገብኩም	ፎቶኮድ	ድግግሞ										
15	የገብስ ጻቦ													
	ስርምግቦች													
16	የተጠበሰ ድንች													
17	ድንች ወጥ													
18	የተቀቀለ ድንች													
19	ካሮት													
20	ቀይ ስር													
21	ቀጩ													
	ቅጠላ ቅጠል													
22	ጥቅል ጎመን													
23	ጥቁር ጎመን													
24	ሰላጣ													
25	ቆስጣ													
26	ቲማቲም ቁርጥ													
27	ቲማቲም ስልሰ													
28	ፎሶፊያ													
29	ቃሪያ													
	ጥራጥሬ													
30	ሽሮ ወጥ													

31	ባቁላኢሹቅ													
32	አተርክክወጥ													
33	ምስርክክወጥ													
34	የለውዝቅቤ													
	የምግብአይነትከዚህ ህበታችየተዘረዘሩትምግቦችበ1አመትውስጥመመገባቸውንይጠይቁ::	400 A ባለፊው1አመትውስጥተመገቦውያውቃሉ	400 B አንዴሲመገቡምን ያክልይመገባሉ?	በቀን ከ 2-3 ጊዜ (ቁጥሩን ይጻፉ)	በቀን አንዴ (ቁጥሩን ይጻፉ)	5-6 * በሳምንት (ቁጥሩን ይጻፉ)	3-4 * በሳምንት (ቁጥሩን ይጻፉ)	2 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	1 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	2-3 በወር (ቁጥሩን ይጻፉ)	1 ጊዜ በወር (ቁጥሩን ይጻፉ)	7-11 *በአመት (ቁጥሩን ይጻፉ)	1-6 *በአመት (ቁጥሩን ይጻፉ)	
		1.አዎ 2.አልተመገብኩም	ፎቶኮድ	ድግ ግ ሞ										
	ፍራፋሬ													
35	አቦካዶ													
36	ሙዝ													
37	ማንጎ													
38	ቡርትካን													
39	አናናስ													
40	ፓፓያ													
41	ሎሚ													
	ስጋ													
42	ክትፎ													
43	ስጋወጥ													
44	የበሬስጋጥብስ													
45	የበሬቁርጥ													
46	የበግጥብስ													
47	የፍየልጥብስ													
48	ቱና													

49	የአሳዋብስ													
	የምግብ አይነት ከዚህ ህበታች የተዘረዘሩት ምግቦች በ1 አመት ውስጥ መመገባቸውን ይጠይቁ።	400 A ባለፈው 1 አመት ውስጥ የተመገበው ያው ቃሉ	400 B አንዴ ሲመገቡ ምን ያክል ይመገባሉ?	በቀን ከ 2-3 ጊዜ (ቁጥሩን ይጻፉ)	በቀን አንዴ (ቁጥሩን ይጻፉ)	5-6 * በሳምንት (ቁጥሩን ይጻፉ)	3-4 * በሳምንት (ቁጥሩን ይጻፉ)	2 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	1 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	2-3 በወር (ቁጥሩን ይጻፉ)	1 ጊዜ በወር (ቁጥሩን ይጻፉ)	7-11 * በአመት (ቁጥሩን ይጻፉ)	1-6 * በአመት (ቁጥሩን ይጻፉ)	
		1. አዎ 2. አልተመገብኩም	ፎቶኮድ	ድግግሞ										
	የወተትተዋጽዎ													
50	የላምወተት													
51	እርጎ													
52	አይብ													
53	የተቀቀለ እንቁላል													
54	የተጠበሰ እንቁላል													
55	ቅቤ													
	ጣፋጭ ምግቦች													
56	ማር													
57	ስኳር													
58	ማርማላታ													
	መጠጦችና ፈጣን ምግቦች													

59	ሚሪንዳ														
60	ከካኮላ														
61	ስፕራይት														
62	ሻይ														
63	ቡና														
64	ማኪያቶ														
65	ቢራ														
66	ጠላ														
	የምግብ አይነት ከዚህ ህበታች የተዘረዘሩት ምግቦች በ1 አመት ውስጥ መመገባቸውን ይጠይቁ::	400 A ባለፊው 1 አመት ውስጥ የተመገበው ያውቃል	400 B አንዴ ሲመገቡ ምን ያክል ይመገባሉ?	በቀን ከ 2-3 ጊዜ (ቁጥሩን ይጻፉ)	በቀን አንዴ (ቁጥሩን ይጻፉ)	5-6 * በሳምንት (ቁጥሩን ይጻፉ)	3-4 * በሳምንት (ቁጥሩን ይጻፉ)	2 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	1 ጊዜ በሳምንት (ቁጥሩን ይጻፉ)	2-3 በወር (ቁጥሩን ይጻፉ)	1 ጊዜ በወር (ቁጥሩን ይጻፉ)	7-11 * በአመት (ቁጥሩን ይጻፉ)	1-6 * በአመት (ቁጥሩን ይጻፉ)		
		1. አዎ 2. አልተመገብኩም	ፎቶኮድ	ድግግሞ											
67	ጠጅ														
68	ወይን														
69	ፒዛ														
70	በርገር														

