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Compliance to Prenatal Iron

Highlights

A Cross-Sectional Study

Triple Burden of Malnutrition

Discovering Thoughts, Inventing Future

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The Effect of Phytochemicals Intake from Green Leafy Vegetables on the Incidence of Gastrointestinal Cancers: A Meta-Analysis

By Dr. Richard Lee Pollock

Lamar State College Port Arthur

Abstract- Study objective was to hypothesize that the consumption of green leafy vegetables (GLV), including cruciferous vegetables (CV), significantly reduces the incidence of gastrointestinal cancers. The hypothesis was answered by using the experimental approach of meta-analysis by synthesizing relevant worldwide studies that address the association between the consumption of GLV and risk of incidence of the disease. The random effect model was used and indicated an overall odds ratio effect size of the 'almost every day' highest vs. lowest quantile intake category of GLV on gastrointestinal cancer as: OR = 0.651 (95% CI. 558 to .760), $p < .001$. These results indicate the highest quartile or quintile of intake of GLV and/or CV compared to lowest in take is associated with a significant 34.9% lower odds of incidence from gastrointestinal cancers.

Keywords: *green leafy vegetables, cruciferous vegetables, random effect model, effect size, forest plot.*

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The Effect of Phytochemicals Intake from Green Leafy Vegetables on the Incidence of Gastrointestinal Cancers: A Meta-Analysis

Dr. Richard Lee Pollock

Abstract- Study objective was to hypothesize that the consumption of green leafy vegetables (GLV), including cruciferous vegetables (CV), significantly reduces the incidence of gastrointestinal cancers. The hypothesis was answered by using the experimental approach of meta-analysis by synthesizing relevant worldwide studies that address the association between the consumption of GLV and risk of incidence of the disease. The random effect model was used and indicated an overall odds ratio effect size of the 'almost every day' highest vs. lowest quantile intake category of GLV on gastrointestinal cancer as: $OR = 0.651$ (95% CI . 558 to .760), $p < .001$. These results indicate the highest quartile or quintile of intake of GLV and/or CV compared to lowest in take is associated with a significant 34.9% lower odds of incidence from gastrointestinal cancers.

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I. INTRODUCTION

Gastroenterology is the branch of medicine focused on the digestive system and its disorders. Diseases affecting the gastrointestinal (GI) tract, which include the organs from mouth to anus, normally include pharynx, esophagus, stomach, pancreas, liver, gallbladder, small and large intestines. Physicians practicing in the field of gastroenterology are called gastroenterologists and have additional specialized training (fellowship) in Gastroenterology. Cancer can invade or spread to all organs of the GI tract. Reducing incidence of these cancers should be a worldwide concern.

Colorectal cancer is also known as colon cancer, rectal cancer, or bowel cancer and develops in the colon sections or rectum which are divisions of the large intestine. This type of cancer is caused by abnormal growth of cells that can invade and spread to other parts of the body (Colon Cancer Treatment (PDQ®), 2014)[1]. This same website lists symptoms that may include weight loss, blood in stool, change in bowel movements, and weights loss causing fatigue. Most colorectal cancers are caused by lifestyle factors and increasing age, with only a small number of incidences due to genetics and the most common risk

factors are diet, lack of exercise, obesity, smoking, and alcoholism (Colon Cancer Treatment (PDQ®), 2014)[1]. Worldwide, colorectal cancer is reported as the third-most common cancer in men, the second-most common cancer in women, and the fourth-most common cause of cancer mortality (Xie & Chang, 2016) [2]. In 2015, these same authors reported that there were about 1.5 million patients worldwide, which accounted for about 10% of total cancer cases, and estimated colorectal cancer caused deaths were an estimated 753,000. It is imperative that medical doctors and surgeons should emphasize on this failure of existing chemotherapeutics against GI cancers and start using complementary/alternative therapeutics to prevent and treat these deadly cancers.

Pancreatic cancer progresses quickly and has an extremely high mortality rate in the U.S. and is the fourth highest cancer fatality rate of all cancers (Chan, Wang, & Holly, 2005)[3]. In 2005, it was estimated that about 32,180 pancreatic cancer patients will be diagnosed, with most of them dying from this cancer with the 5-year survival rate being only 4% (Chan et al., 2005)[3]. These high mortality rates are due to late-stage diagnosis, including lack of effective treatment. Not much is known about the epidemiology of this deadly disease, and like many cancers, it is age-dependent with over 90% of the patients diagnosed at age 50 and older (Chan et al., 2005)[3]. Pancreatic cancer is one of the most rapidly fatal cancers, yet little is known about the primary cause and prevention of this devastating disease.

Pharyngeal cancers originate in the epithelial cells lining the nasopharynx, oropharynx, and/or the laryngopharynx. These cancers are relatively rare, with 130,000 new cases diagnosed worldwide each year (Heck et al., 2008)[4]. The Indian subcontinent has among the highest rates of hypo pharyngeal cancer worldwide; due in part to the common use of chewing tobacco products, and the purpose of their study was to examine the associations between the Indian diet and hypo pharyngeal cancer(Heck et al., 2008)[4].

Based on estimates, a total of 989,600 new cancers of the stomach (gastric cancer) cases and 738,000 deaths occurred in 2008, which accounted for 10% of the total cancer deaths worldwide (Zhao et al., 2014)[5]. Despite advances in treatment, survival rate of

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patients with gastric cancer remains low and it is vital to detect early stages of this cancer by developing new diagnostic and therapeutic strategies for this disease (Zhao et al., 2014)[5]. Esophageal cancer is the sixth most common cancer worldwide, and large geographical variations in its occurrence indicates that environmental exposures are casually important (Phukan, Chetia, Ali, & Mahanta, 2001)[6]. Squamous cell carcinoma of the esophagus occurs at a high frequency in many developing countries such as Iran and northcentral China (Yamaji et al., 2008)[7]. Prevalence of tobacco smoking and alcohol drinking in these regions are not markedly high, so attention has focused on roles of diet, particularly the tendency toward low intake of fruits and vegetables, and the relationship of esophageal cancer incidence.

In recent years, the role of dietary habits in the development of GI tract cancers has received much attention in the scientific community (Zanini, Marzotto, Giovinazzo, et al. 2015)[8]. Dietary habits as risk factors of cancer have been studied by several researchers in relation to the consumption of foodstuffs. This study will contribute to people's understanding of the importance of a daily intake of green leafy vegetables (GLV), including cruciferous vegetables (CV). Studies indicate long-term intake of GLV, CV, and the micronutrients they contain may reduce risk of Type 2 diabetes, cardiovascular disease and some types of cancers (Carter, Gray, Troughton, et al. [9], 2010; Joshipura et al., [10]2009; Smith-Warner et al., 2001)[11]. Limited knowledge about the importance of GLV consumption appears to be a serious worldwide health problem. This meta-analysis study further emphasized the importance of this association by synthesizing multiple source studies researched worldwide on the topic of GLV intake and incidence of GI tractcancers.

GLV are leaf vegetables, greens, vegetable greens, leafy greens or salad greens. They come from a very wide variety of plants all over the world, with nearly one thousand species of plants with edible leaves are known. GLV contain elements and phytochemicals that may reduce the incidence of cancer, and these same GLV are high in Vitamin C, Vitamin E, Vitamin K, and Vitamin A (USDA National Nutrient Database for Standard Reference, Release 24, 2002)[12].

CV are from the family *Cruciferae* which are widely cultivated, with many genera, species, and cultivars being raised for food production such as cauliflower, cabbage, cress, bok choy, broccoli, kale, collard greens and similar leafy vegetables and their roots such as turnips and radishes. Most researchers evaluating the association of fruit and vegetable intake with the risk of cancer place GLV and CV into two separate food categories even though most CV have edible green leaves. They are separated because only CV contain isothiocyanates which are plant phytochemicals that are known to possess the ability to

prevent and inhibit tumorigenesis (Øverby, Thangstad, & Bones, 2015)[13].

Will the consumption of GLV including CV will significantly reduce the incidence of GI tract cancers is the research question of this study? There is a need to research peer-reviewed journals to investigate case-control studies dealing with GLV intake and the incidence of these deadly diseases. This meta-analysis was used to investigate the effects of daily GLV, including CV, intake on the incidence of these type cancers, not just in the United States but worldwide, and to show if this relationship is a significant one. This meta-analysis research approach filled a knowledge gap by combining data from multiple studies to a common effect size and statistically examining relations between study characteristics and findings. Findings between these different studies were compared by transforming the results into a single common effect size to better understand the apparent contradictions in prior research findings.

II. METHODS AND MATERIALS

Searching for relevant studies was primarily performed by computer search engines. PubMed Central, Academic Search Complete, Medline, ProQuest Central, Science Direct, Google, and Yahoo online were the most frequently used online periodical databases. The criteria for including studies in the meta-analysis included: (1) those occurring between 1980 to 2016; (2) those appearing full-text in scholarly journals; (3) the collection of primary studies had to be a collaborative case-control design; (4) those including relations between similar independent variables (GLV intake levels including CV) and dependent variables (incidence of GI tract cancers); (5) all studies had to measure GLV consumption, which was estimated by highest versus lowest quintiles (quintiles, or quartiles, or tertiles); (6) those that reported an effect size of: odds ratio (OR)and their respective 95% confidence intervals (CI) data; and (7) source studies collected in this meta-analysis had to use logistic regression or Cox regression models to control for confounding or interaction variables and the results were expressed as adjusted effect size ratios if needed.

All meta-analysis calculations were performed by the software package Comprehensive Meta-Analysis Version 2 by Biostat (CMA v.2). CMA v.2 was developed specifically for use in meta-analysis. These calculations include determining effect sizes OR and their 95% CI), heterogeneity of the studies, relative weights for each study, significance (p) for each study, and for determining methods for detecting the presence of publication bias and assessing its impact on the meta-analysis. CMA v.2 was also used to create a high-resolution plot (Forest plot) that shows all the combined studies, their p -value, common effect size, 95% CI for

each study, relative weights for each study, and either a fixed effect model or random effect model. Borenstein, Hedges, Higgins, et al. (2009)[14] write that the selection of a model must be based on the question of which model fits the distribution of effect sizes, and when studies are collected from published literature, the random-effects model is a more plausible match for the meta-analysis. Since all studies were collected from full-text in scholarly journals, the random-effects model was chosen for this study.

The relative weights for each study were calculated by the CMA v.2 software package. Small studies tend to have wide confidence intervals and large studies tend to have narrow confidence intervals with larger studies given greater percent relative weights (Higgins, Hedges, Borenstein, et al., 2009)[15]. An effect size of 1.00 represents no treatment effect. Whereas when the effect size falls below 1.00, this indicates participants who consumed GLV in the highest quartile were less likely to develop cancer. If the effect size falls above 1.00, this indicates study subjects were more likely to develop the disease due to GLV intake in the highest intake quartile. The 95% CI bounding in each study reflects the precision of the estimate, with small studies tending to have wide 95% CI and large studies tending to have narrow 95% CI (Higgins et al., 2009)[15]. The use of 95% CI in this meta-analysis was used, so each meta-analysis performed in this study was statistically significant ($p < .05$) if and only if the confidence interval excluded the null value of 1.0 for each effect model synthesized (Higgins et al., 2009)[15]. The conventional value of significance level for this meta-analysis was pre-set to an alpha of 0.05 (Stigler, 2008)[16].

CMA v.2 allows the meta-analyst to record data by subgroups within the study. Some studies collected in this meta-analysis used subgroups, e.g., male, female, GLV, CV, never smoked or chewed tobacco, and ever smoked or chewed tobacco. In this study, it emerged that the effect sizes were not comparable for each subgroup and that the treatment effect varied as a function of each subgroup, so it was decided to use the subgroup as the unit of analysis. This required calculating separate effect size (utilizing the CMA v.2 software) for subgroups within each study, which recorded as many as four treatment effects for each study. CMA v.2 was also used to detect the possible presence of publication bias. All studies used in this meta-analysis were examined using a funnel plot of the natural logarithm of the effect size versus its precision (1/standard error). The plot by precision is the traditional form (Borenstein, Hedges, Higgins, et al., 2009)[14]. Note in Figure 1 that the large studies appear toward the top of the funnel plot graph, and tend to cluster near the mean of the log odds ratios in the relationship between the studies. The smaller studies appear toward the bottom of the funnel plot, and since there is more

random variation in smaller studies, they are dispersed across a wide range of log odds ratios. In the presence of publication bias, the bottom of the funnel plot would tend to show a higher concentration of studies on one side of the mean than the other (Borenstein et al. 2009)[14]. These same authors write that this would reflect the fact that smaller studies are more likely to be published if they have smaller than average OR, which makes them more likely to meet the criterion for statistical significance. In the absence of publication bias the studies will be distributed symmetrically about the mean of the log odds ratios.

III. DATA ANALYSIS AND RESULTS

Over a four-year search period (2012-2016), thousands of scientific papers were reviewed for this meta-analysis. Table 1 shows the total number of collected studies (N=14) that were relevant and reviewed in this meta-analysis. Fourteen case control studies were combined in meta-analysis that examined the relationship between GLV and CV intake and the incidence of GI tract cancers and used OR as the effect size.

Research Question: Does an increased intake of GLV and/or CV significantly reduce incidence of GI tract cancers? Fourteen studies met the inclusion criteria that investigated the relationship between the incidences of GI tract cancers with the consumption of GLV and/or CV. The seven cancers were rectal, colon, colorectal, pancreatic, pharyngeal, stomach, and esophageal. Figure 2 is a Forest plot showing relative weight percentages of the 14 studies with similar odds ratios and a random effect model was used to combine results from the studies. Table 1 lists the 14 studies, locations of the participants, subgroups, number (N) of participants for each study (N = cases + controls), and cancer types. The random effect model was selected for combining the source studies. Subgroups GLV, CV, men only, women only, colon cancer, rectal cancer, ever tobacco, never tobacco, colorectal cancer, and stomach cancer, were not combined in six of the studies to calculate as many as four treatment effects for each study as shown in Figure 2 and Table 1. The random effect model results, $OR = 0.651$ (95% CI .558 to .760), $p < .001$, indicates the highest quartile or quintile of intake of GLV and/or CV compared to lowest intake is associated with a significant 34.9% lower odds of incidence from these seven different cancers. Figure 1 shows possible absence of publication bias in the 14 cancer studies with the studies distributed symmetrically about the mean of the log odds ratios.

IV. DISCUSSION

A noteworthy finding of this meta-analysis study is the protective effect associated with high consumption of GLV including CV. These vegetables are

a characteristic and traditional dietary habit of worldwide populations. It has been previously postulated that this could help explain the low cancer incidence rates observed in populations that consume these vegetables. The role of diet in the causation of human disease is complex, partly because diet and dietary habits include a wide variety of foods and because the methods by which these habits can be measured are cumbersome as well as difficult to apply to many individuals. This study has provided some clues for further investigation into the role of GLV intake and how it affects gastroenterological cancer occurrence. Meta-Analysis is a collection of systematic techniques for resolving apparent contradictions in research findings. This meta-analysis translated results from 14 different studies to a common metric and statistically explore relations between study characteristics and findings. A meta-analysis on a given research topic is directed toward the quantitative integration of findings from various studies, where each study serves as the unit of analysis. The findings between studies are compared by transforming the results to a common single metric called an effect size (Shachar, 2008, pp. 3-4)[17]. Advantages of this meta-analysis is to increase validity of research by applying objective formulas to synthesize data across studies rather than using data from a single study and control for between-study variation (Borenstein, Hedges, Higgins, et al. 2009)[14].

The fourteen case-control studies included 24,205 case participants and controls, with 8,182 case participants having seven different type cancers. The research question of this study was; does an increased intake of GLV including CV significantly reduce the incidence of these seven cancers? The random effect model indicated an overall OR effect size of the 'almost every day' highest vs. lowest quantile intake category of GLV on cancer as: $OR = 0.651$ (95% $CI .558$ to $.760$), $p < .001$, showing 34.9% lower odds that an intake of GLV significantly reduces the incidence of these cancers in the highest intake category as compared to the lowest.

a) *Aggregation of Studies Encompassing Various Cancer Diseases*

This meta-analysis study could be limited by the aggregation of studies encompassing various cancer diseases. It is important to know which specific cancers are affected by a dietary factor to gain further knowledge into potential disease causes. However, the prevention of overall cancer diseases by diet may be of higher interest for any healthy population than the targeted recommendations for prevention of a specific cancer (Von Ruesten, Feller, Bergmann, et al, 2013)[18]. Hung et al. (2004)[19] evaluated the relationship between fruit and vegetable intake and the incidence of CVD, total cancer, and other deaths from other causes in two prospective cohort studies. Von Ruesten et al.

(2013)[18] also combined overall chronic diseases, type 2 diabetes, overall CVD, and overall cancers in their published article on the relationship of diet and disease incidence which concluded that from a public health perspective, it would be better to pursue the primary prevention of several types of aggregated disease outcomes. This meta-analysis presented both overall and disease-specific results.

b) *Incidence of Cancers and GLV Intake*

Cancer is a group of over 100 different types of malignancies and there are several potential substances in GLV and CV that may exhibit anticancer effects (Rajalakshmi & Agalyaa, 2010)[20]. GLV are typically high in dietary fiber, iron, calcium, and very high in phytochemicals and nutrients such as vitamin C, carotenoids, lutein, folate, magnesium as well as vitamin K. The primary dietary source of vitamin K is generally GLV and both in vitro in vivo studies have shown that vitamin K exhibits anticancer effects (Chlebowski, Akaman, & Block, 1985) [21]. Vitamin K has also been shown to inhibit the growth of mammalian tumor cells in culture (Prasad, Edwards-Prasad, & Sakamoto, 1981)[22]. Also, GLV are high in carotenoids such as beta-carotene and in animal experiments they were shown to suppress liver carcinogenesis (Moreno et al., 2002)[23]. Carotenoids have antioxidant potential in the scavenging of harmful free radicals (Krinsky, 1989)[24] and they appear to play an important role in the prevention of hepatitis virus-related liver carcinogenesis (Kurahashi et al., 2009)[25]. Rajalakshmi and Agalyaa (2010)[20] found that watercress (*Nasturtium officinale*) has an anti-cancer effect in their study of oral cancer. Watercress is one of the richest sources of dietary phenethyl isothiocyanates and they found it inhibited a chemical in tobacco that may cause oral cancer. Also, in several epidemiological studies, high intake of calcium has been associated with reduced risk of colorectal and breast cancer (Martinez et al., 1996[26]; Shin et al., 2002)[27]. It has been hypothesized that calcium could be the mechanism behind these protective effects by reducing fat induced cell proliferation by maintaining intercellular calcium concentrations (Lipkin & Newmark, 1999)[28].

c) *Phytochemicals*

Further study in the twenty first century should be focused on conducting extensive research to discover phytochemicals connections to disease prevention because solid evidence is lacking (DeBruyne, Pinna, & Whitney, 2011)[29]. Researchers are just beginning to understand and theorize how a small percent of the different phytochemicals in GLV work. There are potentially thousands of phytochemical compounds from extracts of plant roots, leaves, and stems that have shown promising potential as anticancer drugs, or for serving as lead compounds in the synthesis of new drugs (Smith, 1998[30]; Buring &

Hennekens, 1995[31]; Park et al., 2013[32]. The potential is here just waiting for new researchers to cure cancer, type 2 diabetes, and CVD via new phytochemical drug discoveries. Table 2 shows a small sampling of phytochemical compounds and their possible effects on reducing incidence of cancers.

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Author Contributions

Dr. Richard Lee Pollock was sole author of this manuscript and was sole writer and researcher.

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No conflict of interests is declared with this research.

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Ethical Approval

IRB at Trident University International ethically approved the content of this meta-analysis (no human subjects used).

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Table 1: Number (N) of participants per study (N = cases + controls), location of studies, cancer type, and subgroups for each study

Study N Location		Type of Cancer & Subgroups	
Glynn et al. (1996)1	420	Finland	Colon, GLV
Glynn et al. (1996)2	420	Finland	Rectal, GLV
Wu et al. (2009)1	2281	USA	Colorectal, GLV
Wu et al. (2009)2	2281	USA	Colorectal, CV
Slattery et al. (2000)	3838	USA	Colon, CV
Annema et al. (2011)	1773	Australia	Colorectal, GLV
Vogtmann et al. (2014)	1013	China	Colorectal, CV
Hu et al. (2007)1	4477	Canada	Rectal, Women, CV
Hu et al. (2007)2	4477	Canada	Rectal, Women, GLV
Hu et al. (2007)3	4477	Canada	Rectal, Men, CV
Hu et al. (2007)4	4477	Canada	Rectal, Men, GLV
Chan et al. (2005)1	2233	USA	Pancreatic, GLV
Chan et al. (2005)2	2233	USA	Pancreatic, CV
Olsen et al. (1989)	432	USA	Pancreatic, CV
Jansen et al. (2011)	1367	USA	Pancreatic, GLV
Heck et al. (2008)1	1231	India	Pharyngeal, GLV, Never Smoked
Heck et al. (2008)2	1231	India	Pharyngeal, CV, Never Smoked
Heck et al. (2008)3	1231	India	Pharyngeal, GLV, Ever Smoked
Heck et al. (2008)4	1231	India	Pharyngeal, CV, Ever Smoked
Liu et al. (2012)	1200	China	Nasopharyngeal, GLV
Hara et al. (2003)1	436	Japan	Gastric, CV
Hara et al. (2003)2	436	Japan	Colorectal, CV
Phukan al. (2001)	1506	India	Esophageal, GLV
Cheng et al. (1992)	1998	China	Esophageal, GLV

Table 2: Sampling of phytochemicals and possible cancer reducing effects (from DeBruyne, Pinna & Whitney, 2011)

Name	Possible Effects
Carotenoids	Act as antioxidants; possibly reduce risk of cancer
Flavonoids	Act as antioxidants; may scavenge carcinogens
Indoles	May trigger production of enzymes that block DNA damage from carcinogens
Isothiocyanates	May inhibit enzymes that activate carcinogens and detoxify carcinogens
Organosulfur	May speed production of carcinogen-destroying enzymes
Phenolic acids	May trigger enzyme production to make carcinogens water soluble to excrete
Phytoestrogens	May reduce cancer cell survival
Phytoestrogens	Block estrogen activity in cells, possibly reducing risk of colon cancer
Protease inhibitors	May suppress enzyme production in cancer cells, slowing tumor growth
Saponins	May interfere with DNA replication, preventing cancer cell from multiplying
Tannins	May inhibit carcinogen activation and cancer promotion; act as antioxidants

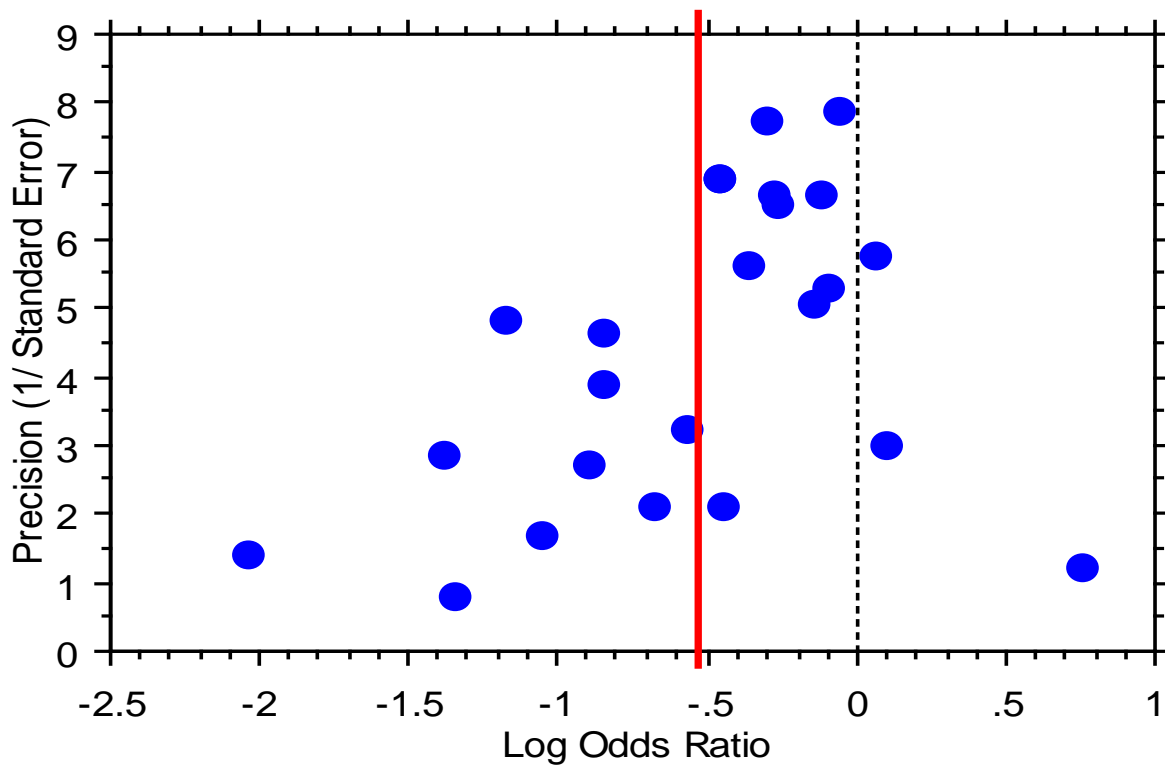
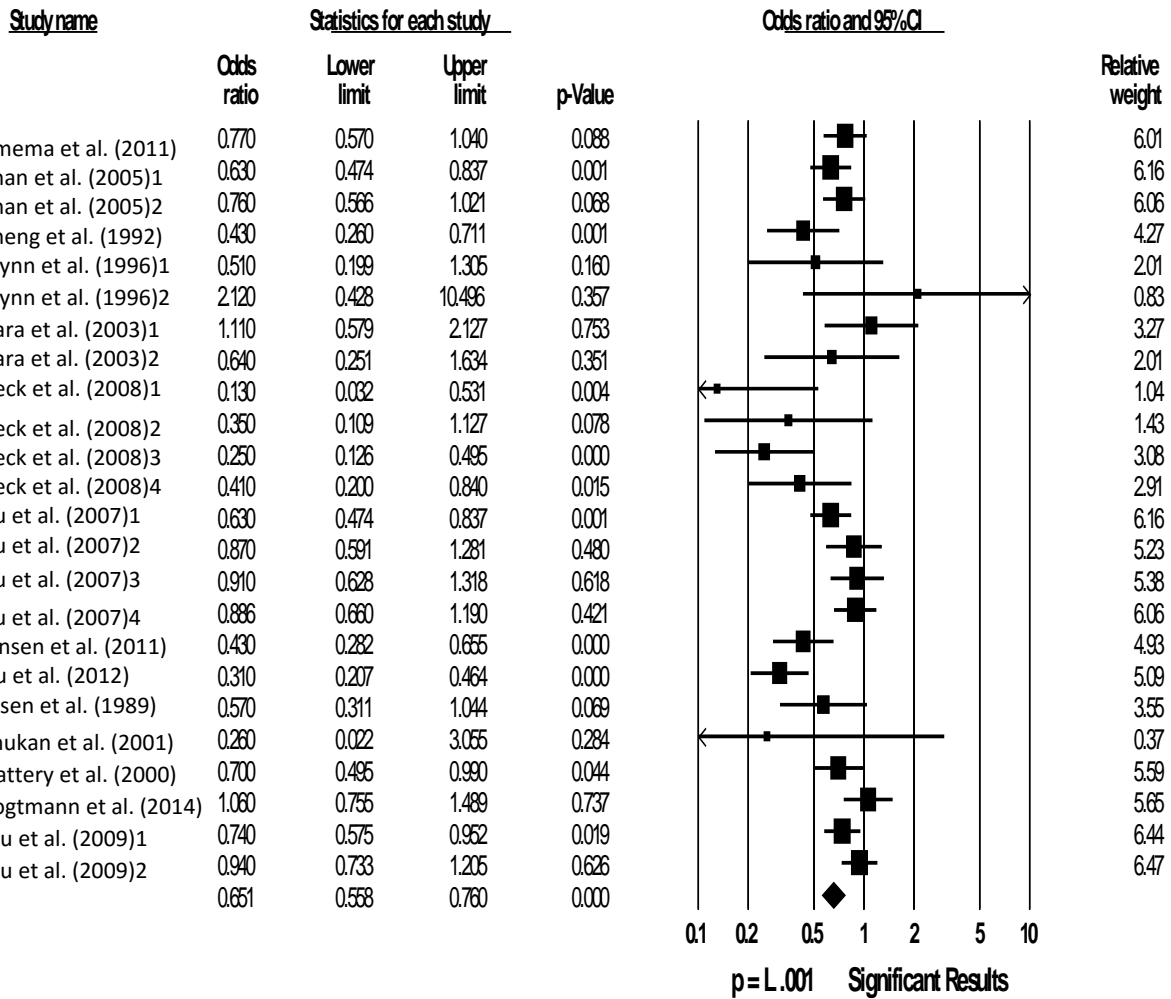


Figure 1: Funnel plot showing 14 case-control studies with 10 study results on the left of mean log odds ratio (-0.536) and 14 study results on the right signifying possible absence of publication bias





Random Effect Model = .651 (.558 to 0.76)

Figure 2: Forest plot showing a significant 34.9% lower odds of incidence of cancer by consuming a high quantile intake of GLV and/or CV as compared to the lowest intake



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Vulnerability of Urban Poor Women and Children to the Triple Burden of Malnutrition: A Scoping Review of the Sub-Saharan Africa Environment

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Abstract- Research in sub-Saharan Africa (SSA) show a rapidly increasing trend in co-existence of hunger, micronutrients deficiency as well as overweight/obesity. The paper, vulnerability of urban poor women and children to the triple burden of malnutrition aims at exploring the situation of poor urban women and children in regard to the triple burden of malnutrition in SSA. 65 sources of information were retrieved for review. Many socio-economic and systemic factors appear to put poor urban women and children in SSA slums at a greater risk of the triple burden of malnutrition. The triple burden of malnutrition has devouring effects on the growth and development of women and children. Evidence suggests high prevalence of the existence and effects of the three tier complexity of malnutrition (hunger, micronutrients deficiency and over nutrition) among urban poor women and children in SSA.

Keywords: nutrition, nutrition in women, nutritional health, hunger, micronutrients deficiency, maternal and child nutrition health, overweight and obesity.

GJMR-L Classification: NLMC Code: QU 145.5



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Abstract- Research in sub-Saharan Africa (SSA) show a rapidly increasing trend in co-existence of hunger, micronutrients deficiency as well as overweight/obesity. The paper, vulnerability of urban poor women and children to the triple burden of malnutrition aims at exploring the situation of poor urban women and children in regard to the triple burden of malnutrition in SSA. 65 sources of information were retrieved for review. Many socio-economic and systemic factors appear to put poor urban women and children in SSA slums at a greater risk of the triple burden of malnutrition. The triple burden of malnutrition has devouring effects on the growth and development of women and children. Evidence suggests high prevalence of the existence and effects of the three tier complexity of malnutrition (hunger, micronutrients deficiency and over nutrition) among urban poor women and children in SSA.

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I. INTRODUCTION

In conceptualizing nutrition health, it is important to think beyond just the aspects of food intake, absorption and metabolism, hence consider the balance between what is eaten vis-a-vis what the body requires (1). It is only then that the two hazardous concepts of over- and under- nutrition make sense. Food security is based on four main processes. These include: food availability; food access; food utilization; and food stability (2)(3). However in many low to middle income countries, little attention is usually paid on the quality of food available or rather accessed.

In its African regional nutritional strategy (2005-2015), the African Union notes with concern that malnutrition is one of the most important health and social challenges facing Africa and one of the leading causes of deaths among children below five years (1). Overtaken by events, it is evident that Africa is far from what was then target 1.C of the millennium development goals which sought to halve the proportion of people who suffer from hunger by 2015 (4). Thus, the Sustainable Development Goal 2 on zero hunger continue to envision an end to hunger, achieve food security, improve nutrition and promote sustainable agriculture by 2030 (5).

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The 20th century's rapid growth of cities in SSA came with a mixed bag of advantages and detriments. Whereas urbanization has continued to generate and attract investments, higher incomes, basic facilities, stronger institutions and economic opportunities to inhabitants, the urban expansion and related benefits continue to be uneven. As a consequence, millions of the urban poor in slums are marginalized in an effort to confront the day to day challenges and deprivations of their rights. Whereas efforts in humanitarian and food security sectors have focused on rural drier regions in many SSA countries, it is appearing that the urban poor are unrecognizably faced with both acute and chronic food insecurity (6).

Estimates suggest that by 2020, 75% of all urban dwellers across the world will be from the low and middle income countries of Africa, Asia and Latin America. Worryingly it is also estimated that by 2020, 40-45 % of the poor in Africa and Asia will be concentrated in towns and cities (7). Since the 1990s, trends have shown that poverty, hunger and malnutrition were on the increase in SSA (4)(2). Studies show that SSA is home to some of the most food insecure populations in the world. This is attributed to factors including poor policies, inequality, poor infrastructure, limited resources, coupled with conflict, diseases and poor access to health services (3)(7).

Findings from many studies show that women in resource poor countries are at risk of inadequate intakes of multiple micronutrients. Findings in a review of studies published between 1988 and 2008 show that in most studies that were reviewed, intakes of folate, iron and zinc were very low in Africa, Asia and Latin America. For instance, folate intake was found to be predominantly below the estimated average requirement in most studies among non-pregnant women (82%). According to the review, the mean/median intakes of iron were more often below estimated average requirements in studies among non-pregnant women (93%) compared with studies among pregnant women (78%) (8). Beyond the processes of availability, access and utilization, the issue of high quality diet has become a major challenge among majority of populations in SSA. Diets in many parts of SSA have been found to be largely composed of cereal or root staple foods but little of vitamins rich animal products and vegetables (3).

For example a national assessment of the level of anemia, iron, vitamin A, and zinc in Kenya revealed notably high prevalence rates of these micronutrients deficiencies among Kenyan children based on environmental and many other socio-economic factors(9).

The imbalance in micronutrient content in foods, nutrition transition, poor eating habits and change in lifestyle in urban settings across SSA has led to an alarming upsurge in risk factors to, and related chronic diseases such as over weight/obesity, diabetes, cancer, hypertension, liver diseases and cardiovascular diseases (CVDs). Apparently the prevalence of risk factors for chronic diseases such as CVDs is high among urban populations compared with rural populations (10)(11)(12). Statistics from many developing countries including Kenya are showing a contradictory, yet worrying and confusing increase in: urban population; urban poor; urban food poverty and over-nutrition (overweight/obesity).

Worryingly, women represent 49% of the urban poor. Implying that if the urban poor are at risk of hunger, micronutrients deficiency and overweight, then within that population, women are the majority(13).

II. AIM OF THE PAPER

Hitherto, there exists isolated data and unsystematic information on the triple burden of malnutrition in SSA. The aim of this scoping review is to map available evidence on nutritional status in SSA within a three dimensional perspective of hunger, micronutrients deficiency and over nutrition. The paper focuses on the state of urban poor women and children

in SSA within the spectrum of hunger, micronutrients deficiency and over nutrition.

III. METHODS

The paper is built on a desktop review of literature on hunger, micronutrient deficiency and over nutrition. More than 630 documents were obtained via various scientific online databases including PubMed, Medline, Cochrane, Popline, and google scholar. The search was done by two researchers using key words such as nutrition, nutrition in women, nutritional health, hunger, micronutrients deficiency, maternal and child nutrition health, overweight and obesity. Only literature that focuses on nutrition status in SSA and further to women and children in urban poor settings were included. This resulted to 65 documents being considered relevant. The documents were stored in a Mendeley library specifically created for the purpose of coming up with an annotated bibliography and drafting the paper. The reviewed literature includes published articles in peer reviewed journals, research reports, national and regional policy documents, and presentations from conferences, meetings and events in SSA.

IV. LIMITATIONS OF THE PAPER

The paper uses existing literature. However a lot of the existing literature focuses mainly on either one or two components of the triple paradox of malnutrition. This situation limited the desired vigorous level of analysis of available data and information within similar settings and populations from which the available evidence was collected.

V. RESULTS

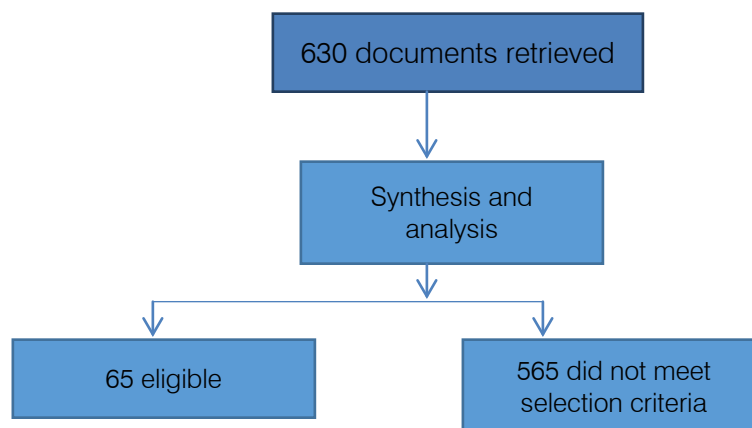


Figure 1: Retrieval and culling of documents during literature review and analysis

Only 65 documents out 630 retrieved met the inclusion criteria. This is only about 10.3%.

a) State of hunger in urban cities of SSA

The rising, volatile food prices and food insecurity commonly referred to as the food crisis is a global phenomenon. There has been an alarming

increase in both international and local prices of basic foodstuffs particularly since 2003. For example in March 2008, Food Agriculture Organization's food index showed that food prices for cereals, dairy products,

meat sugar and oils had increased by 57% compared with their level in March 2007(14). The surging food prices is of particular concern to the urban poor in SSA given that the poor spend large portions of their household income on food(15). In Kenya, major increase in food prices began being experienced in 2006 and has tremendously continued to increase year in, year out. The Kenyan food prices increasing trend as is the case in many other countries in SSA, does not waver even during seasons when world food prices are on a decline(16)(17).

In its African regional nutritional strategy (2005-2015), the African Union notes with concern that malnutrition is one of the most important health and social challenges facing Africa and one of the leading causes of deaths among children below five years (1). It is evident that Africa is far from what was then target 1.C of the millennium development goals which sought to halve the proportion of people who suffer from hunger by 2015 (4). Thus, the Sustainable Development Goal 2 on zero hunger continue to envision an end to hunger, achieve food security, improve nutrition and promote sustainable agriculture by 2030 (5).

b) Factors contributing to urban hunger in SSA

Most of the factors that contribute to urban hunger result from the reality of overdependence on food purchasing as the main system of food in urban settings(18). As it was noted in the 1980s, during the green revolution, a decrease in food purchasing power has the potential to lead to food emergencies and famines(2)(19)(6). Most of the inhabitants in urban cities in SSA live in rented houses and do not own any land. This implies that urban agriculture is never an option to the majority of the urban inhabitants. On the other hand, as buildings and infrastructure continue to be developed alongside a rapidly bulging urban population, agricultural land in most urban cities is dwindling to almost unavailable. In many urban cities, relationships are organized on economic and/or political basis thus social systems through which food donations and borrowing were thriving in traditional African society have faded away. Time constraints in urban settings also stimulate the habit of ready to eat non-home prepared foods(20). However the increase in food prices and sometimes unavailability of high quality foods in urban markets make access to food through purchasing a real problem. An underlying factor to limited power to food purchasing is poverty. With notable economic development in the last one to two decades, SSA has the largest population of the poor, accounting to about 30% of the most poor in the world (18).

c) Urban Women and children as the most at risk of hunger

Many countries in SSA continue to experience high rates of unemployment and underemployment. In

many SSA countries, women suffer more from unemployment than men. In addition, the available job opportunities in the vast of urban cities in SSA are manual job which are unfavorable to women who might be lacking the knowledge and skills required for the hardly available white collar better paying jobs. Research in SSA show higher rates of unemployment and underemployment among women than national rates (21)(22). Low income, low assets, lack of opportunities and social exclusion put women and their children on the vicious circle of poverty. Poverty then results in hunger, lack of shelter, illiteracy, and poor access to health care. Women in SSA are highly predisposed to both contingent and structural poverty(23).

On the flip side, majority of the few urban women who are employed, work outside their homes. This implies that caring for children and optimal feeding practices become difficult(7).

Whereas single motherhood has rapidly grown in most urban centers in SSA, it is also emerging that the erosion of the African family gender roles between men and women, coupled with hard economic times are slowly leading to men figureheads faced with the challenge of providing for their wives and families. Thus women are single handedly left with the double burden of taking care of selves and their children (24). A study on health effects of single motherhood on children in SSA revealed that compared with children whose mothers were in union, children of single mothers who were not widows were more likely to be stunted. Fewer economic resources and limited parental care were also significantly associated with higher odds of stunting in single mother households. The study concluded that single motherhood was a risk factor for children's nutritional status and chances of survival before five years(25). Research show that improving income among women can greatly improve household community food security (26). Several demographic and health factors of mothers are associable with different indicators of nutritional status among their children. In one study, increasing maternal education attainment and Body Mass Index (BMI) were significantly linked with decreasing stunting among their children. On the other hand children of mothers who had not worked in the last four weeks had significantly lower proportions of stunting. However these same children were assessed with significantly high proportions of wasting, overweight and obesity(27).

d) Effects of hunger in women and children

Worsening food insecurity in urban settings in many countries in SSA is one of the leading direct and indirect causes of morbidity and mortality among women and children. The nature, extent and duration of coping strategies to food insecurity in urban settings by women determine the magnitude and severity of their

suffering and their children (18). Studies in many countries including Kenya, Ethiopia, Swaziland, Brazil, and Nigeria indicate that hunger is a key factor in pushing women into sex work. The two pathways in relation to entry into sex work as a result of hunger are that one, men who have means takes advantage of desperate women so that while they, men provide support in terms of money and food to women, women reciprocate with sex. Two, hungry women are forced to aggressively go out to sell sex in search for food or majorly money for food lest they and their children die of hunger(28)(29)(30). As indicated above, depending on the severity of the hunger, food insecurity has been proven to not only lead women into sex work but also increase their chances of engaging in unprotected sex (31).

Considered as a key indicator of childhood undernutrition, stunted linear growth is highly prevalent in most low to middle income countries in SSA. This has been found to have damaging consequences on development and health of children in many developing countries. Globally, statistics show that there has been a decreasing trend in the number of stunted children (253 million in 1978, 178 million in 2005 and 165 million in 2011). However the slow reduction rate of (2.1% per year) has been a concern to partners. Globally, 8% of children under 5 were in 2011 considered as wasted. Considering 2010 as the baseline year, the World Health Assembly (WHA) called for a 40% reduction in the number of stunted children by 2025(32).

e) *Micronutrients deficiency among urban poor women and children in SSA*

Using the concept of hidden hunger, which is associated with micronutrient deficiencies, the Food and Agricultural Organization (FAO) estimates that 850 million people across the world are hungry. FAO states that malnutrition is purported to affect up to a half of the world's population(33). Iron deficiency is the most prevalent single nutrient deficiency affecting an estimated 2 billion people worldwide. Iron deficiency and anemia are known to be most prevalent in developing countries. Although Iron deficiency can occur at any stage in a life cycle(34), the most vulnerable groups include women and children. Globally 469 million women of reproductive ages are anemic with at least 50% resulting from dietary iron deficiency(35). In South Africa studies have reported iron deficiency in 7-29% of pregnant women, 57% in pregnant teenage girls, 21% in infants and 26% in non-pregnant teenage girls(36).

In many SSA countries, under nutrition is associated with wide spread micronutrient deficiencies (3,13,14,27,37,38). Kenya's nutritional profile indicates that iron and Vitamin A deficiencies are the most prevalent in the country. For example, just over half (55%) of pregnant women experience iron deficiency

anemia compared to 47.9% of non-pregnant women. Approximately 40% of women experience vitamin A deficiency. 17% of pregnant women in Kenya are Vitamin A deficient with about 52% of mothers being zinc deficient. Although there is a dearth of information, iodine deficiency disorders are still prevalent in Kenya (39)(40).

Studies conducted at antenatal clinics in many developing countries paint a picture of a population that is severely malnourished in terms of essential minerals and vitamins (3,8,16,28,41-45). This situation is worsened in the event of HIV positive prospective mothers. One study in Mombasa Kenya conducted in a prevention from mother to child antenatal clinic revealed that throughout the study period, the overall prevalence of anemia (Hb < 11 g / dl) at the first antenatal clinic (ANC) visit remained stable: 84.2% in 2004, 86.6% in 2005 and 84.1% in 2006. Even though the study displayed marked differences between urban and rural populations [about four in five rural women (7461 / 9441; 79.0%) and two in three (2822 / 4248; 66.4%) urban women had a Haemoglobin between 7 and 11 g / dl (P < 0.001). An additional 10.2% of rural and 9.8% of urban women were severely anemic (Hb < 7 g / dl)](46). It is important to note that with rapid increase in food prices since 2004 in Kenya the figures could have worsened in both populations by now(47)(48).

f) *Effects of micronutrients deficiency on women and children*

Micronutrients deficiency is known to have staggering consequences for human health and well-being as well as hampering economic productivity. In women of reproductive ages micronutrients deficiency lead to increased pregnancy complications and maternal mortality(49)(50)(51).

It is evident that essential minerals' and vitamins' deficiencies have wide spread adverse effects on child survival and development. Deficiencies of vitamin A and zinc inhibit child survival and health. Attaining Developmental potential in many children in SSA is curtailed by deficiencies in iron and iodine coupled with stunting (32).

g) *Over nutrition among women and children in SSA*

Women and children within settings of high vulnerability to food security are more likely to rely on street based high energy dense foods which predispose them to obesity. Moreover access to low quality food limited in dietary diversity may lead to obesity, conditions typical of the urban poor women and children in SSA (52,53).

Overweight and Obesity (O/O) are modifiable risk factors for the development of non-communicable diseases (NCDs). With the current increasing rates in O/O of about 5% per year across SSA, there are high predictions of accompanying increase in NCDs and diabetes mellitus 2. Across SSA, the prevalence of

overweight/obesity appear to be most visible among populations in urban settings. Factors such as dependence on ready and fast foods, reduced physical activity, and poverty, predispose urban populations to O/O more than their rural counterparts (10,20,27,38, 54,55). A study in Kenya showed that O/O are usually more prevalent in women specifically in the 25 to 40 age range. This is mainly attributable to the retention of gestational weight gain and also the outcome of numerous lifestyle factors such poor diets, inactive lifestyles, urbanization and adoption of diets that veer away from traditional menus(56).

By 2003, already almost one-quarter of women in Kenya were overweight or obese(56). Seemingly a positive trend was observed with advancing age. Prevalence of O/O were much higher in the urban sector (38%) compared with the rural sector (18%)(57). In 2009 the Kenya Demographic Health Survey (KDHS) indicated that the national prevalence of overweight and obesity was 23%. Across the country, urban areas had higher prevalence rates compared with the rural areas (58).

Although there is a dearth of information on childhood overweight/obesity in SSA, the little available research show that child overweight/obesity SSA is on the increase. This situation is associated with factors such sex of the child, age of the child, mother's Body Mass Index and work status of the mother (59).

h) Effects of over nutrition in women and children

Overweight/ obesity causes poor health, negatively affects quality of life and shortens the quantity of life. Uniquely in women, obesity causes conditions such as osteoarthritis, birth defects, breast and endometrial cancers, cardiovascular and gall bladder diseases, infertility, gynecological complications, urinary stress incontinence, stigma and discrimination(56). Childhood overweight is associated with negative health and psychological effects as evidenced in overweight children. Although preventable, childhood overweight leads to lifetime health problems which are expensive and painful to manage(59).

i) Policies, services and programs

Global and national agrarian policies have been reported to have significant social and economic consequences in SSA. For instance whereas there has been rapid increase urbanization and inequalities in land ownership, SSA countries still have high levels of participation in the agricultural sector. However this has not improved access to resources and better diets among urban poor women and children in SSA(26).

The conception of the idea of food for development was significantly marked by the formation of World Food Programme (WFP) in 1963. This provided an understanding of food as necessity for development and of course development as necessity for food security. In the 1990s concrete plans were put in place

to ensure reduction in hunger and malnutrition. The human right approach to adequate food security was reaffirmed. However few committed national governments have taken up more proactive roles(2). Many countries in SSA lack policies and implementing frameworks for targeted and holistic nutrition interventions. In addition there is limited capacity and expertise in SSA to handle emerging nutritional challenges.

VI. DISCUSSION

Many countries in SSA have found themselves in the mix-up of hunger, micronutrients deficiency and overweight unawares. The petite available relevant literature review indicates that there is limited knowledge and information on malnutrition focusing on malnutrition among the urban poor. There is need for rigorous research in this area. Studies show that the possible co-existence of the three conditions in an individual, household or community has dire health and developmental effects(54). The co-occurrence of overweight/obese mothers and undernourished children in the same household is now considered an important common phenomenon in many countries in SSA including Kenya. This has been associated with an increase in consumption of high energy dense foods with reduced physical activity. Contrary, the high energy dense foods are those that are of low nutrient content hence do not provide enough quality nutrients to children and women(60). For instance, many studies in SSA have proven the significantly high level of co-existence between iron deficiency (a result of dietary deficiency or hunger) and overweight in study populations. Evidence suggest that iron deficiency and overweight do not only co-exist but interact with adverse consequences. Consistent study findings indicate that overweight individuals at all ages have a significantly high likelihood of having higher rates of iron deficiency compared with their normal weight counterparts(61)(62). Whereas hunger and micronutrient deficiency continue to devour poor women in urban slums and informal settlements, studies continue to show that these women have higher rates of overweight than their male and female counterparts in both similar urban settings and even rural areas(10).It is estimated that 53% of deaths associated with infectious diseases among children in developing countries, majority of which are in SSA, are associated with poor nutrition(55).Whereas the effects of the triple burden of malnutrition are glaringly hazardous, many governments, partners in development and individuals in SSA have not awoken to the realization that the future survival and health of urban poor women in SSA is more than ever before jeopardized. There remains poor or no policies and programs to address the whole spectrum of malnutrition and individuals, particularly the urban poor women and their children

continue to survive on risky strategies that increase their exposure to even worse health conditions. There is need for urgent interventions that can address the highly prevalent poor diets and poor eating habits such as dependence on fast foods and street food which have bad future impacts on the health of the current poor urban dwellers, particularly women and children. Even though consumer choices for food are determined by prices in urban slums in SSA, education programs would play a critical role given that taste and nutrition influence food choices (63)(64).

VII. RECOMMENDATIONS

Given that food security is a human right, policies and programs need to adopt the three dimensional definition and perspective in addressing the challenges of food and nutrition insecurity. This would provide holistic long term solutions to the nutritional and health challenges in SSA. Providing a hungry child with food that does not contain necessary micronutrients is not enough, just like providing a hungry pregnant woman with an iron supplement or tablet without food may not be enough. Concerted efforts are required to ensure preventive mechanisms are put in place to deter chronic diseases as a result of preventable lifestyle risky behaviors including food choices and eating habits. The World Bank generally states that the cost of inaction towards preventable conditions and diseases related to diet and lifestyle is clear and unacceptable (65).

Governments and partners in SSA need to conduct assessment of nutritional status to determine the level of hunger, micronutrient deficiency and over nutrition among women and children. This will go a long way in informing planning and implementation of policies, services and programs.

Moreover SSA need to make serious assessments of the current burden and risk factors to lifestyle diseases. Whereas studies have shown that there is a glaring increase in chronic diseases and associated risk factors, governments in many developing countries have not taken any meaningful steps in attempting to address or prevent risk factors to chronic diseases among its populations. It is important for Government and partners in SSA to think prevention since treatment of the of chronic diseases would be more expensive particularly given that health systems in developing countries are still grappling with infectious diseases.

Programmatically, there is need for continued concerted efforts in social and economic empowerment of women to enhance healthy food and nutrition security. Research shows that an empowered woman can contribute to an empowered household and community.

VIII. CONCLUSION

Although the available data is haphazard and limited, it shows a concentration of the three tier complexity of malnutrition among urban poor women and children in SSA. The vulnerability of women is buttressed by the unfavorable urban social and economic systems in SSA. Operating within very limited policies and programs that are not strategic, concerted efforts seem to be more focused on micronutrients deficiency and hunger and only during emergencies with limited or no focused attention on over nutrition.

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Author's Contribution

CM was involved in conceptualizing of the study, literature search, documents review, and development of the annotated bibliography, analysis of data and overall drafting of the paper. GP was involved in conception of study design and review for intellectual content. JM did further literature review and reviewed the paper.

Competing interests

The authors declare that they have no competing interests.

Abbreviations:

CVDs-Cardiovascular Diseases;
FAO- Food Agricultural Organization;
NCDs-Non-Communicable Diseases;
SSA-Sub-Saharan Africa;
WFP-World Food Programme

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Nutritional and Microbial Evaluation of Commercial Apple Juices Available in Market of Peshawar City

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Abstract- The present study was aimed to carry out quality assessment of different commercial apple juices available in the market of Peshawar city. Physicochemical characteristics like moisture, total soluble solids (Brix°), pH, acidity (%), Vit-C (%), total dissolved solids (ppt), reducing sugars (%), non-reducing sugars (%) and SO₂ residue concentration (g/Kg) and microbial analysis of six juice samples were carried out. % moisture contents of sample VI was found higher (88.25 ± 1.88) and low of sample III having % moisture content (82.67 ± 1.71). Of all the samples, sample III has highest TSS (13.1 ± 0.82), in contrast lowest TSS was found for sample VI (1.17 ± 0.15). pH was found in the range of 3.39 ± 0.05 to 3.08 ± 0.01 . Higher pH was observed for sample VI and lower for sample II. Total acidity (%) was observed maximum for sample I (0.83 ± 0.05) and was found minimum for sample VI (0.11 ± 0.03). Sample III has maximum Vit-C concentration (%) of 26.01 ± 0.05 and sample VI has minimum Vit-C content (%) i.e. 14.00 ± 0.10 . Total dissolve solids (TDS) of the commercial apple juice samples (I-VI) were recorded in the range of 0.84 to 0.23. Highest TDS was found for sample I and lowest for sample II. Maximum % reducing and non-reducing sugars were observed for sample I i.e. (21.45 ± 0.93) and (2.1 ± 0.74) respectively, while in sample V and VI no content of (0.00) of % reducing and non-reducing sugars were found. Of all the selected juice samples, only samples I and III showed SO₂ residues concentration within WHO standard (< 0.03 g/Kg) and were found suitable for human consumption. Highest TPC were found in sample VI (30 cfu/mL). TCB was found in normal range (< 1.1) and E.Coli were absent in all selected juice samples.

Keywords: apple juices, quality assessment, SO₂, physico-chemical analysis, WHO standard.

GJMR-L Classification: NLMC Code: QU 145.5



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Sana Irshad Khan^α, Zafar Iqbal^σ, Ubairah^ρ, Arsalan Khan^ω, Falak Naz Shah^ω & Abid Shah Shinwari^ω

Abstract- The present study was aimed to carry out quality assessment of different commercial apple juices available in the market of Peshawar city. Physicochemical characteristics like moisture, total soluble solids (Brix°), pH, acidity (%), Vit-C (%), total dissolved solids (ppt), reducing sugars (%), non-reducing sugars (%) and SO₂ residue concentration (g/Kg) and microbial analysis of six juice samples were carried out. % moisture contents of sample VI was found higher (88.25±1.88) and low of sample III having % moisture content (82.67±1.71). Of all the samples, sample III has highest TSS (13.1±0.82), in contrast lowest TSS was found for sample VI (1.17±0.15). pH was found in the range of 3.39±0.05 to 3.08±0.01. Higher pH was observed for sample VI and lower for sample II. Total acidity (%) was observed maximum for sample I (0.83±0.05) and was found minimum for sample VI (0.11±0.03). Sample III has maximum Vit-C concentration (%) of 26.01±0.05 and sample VI has minimum Vit-C content (%) i.e. 14.00±0.10. Total dissolved solids (TDS) of the commercial apple juice samples (I-VI) were recorded in the range of 0.84 to 0.23. Highest TDS was found for sample I and lowest for sample II. Maximum % reducing and non-reducing sugars were observed for sample I i.e. (21.45±0.93) and (2.1±0.74) respectively, while in sample V and VI no content of (0.00) of % reducing and non-reducing sugars were found. Of all the selected juice samples, only samples I and III showed SO₂ residues concentration within WHO standard (<0.03 g/Kg) and were found suitable for human consumption. Highest TPC were found in sample VI (30 cfu/mL). TCB was found in normal range (<1.1) and *E.Coli* were absent in all selected juice samples.

Keywords: apple juices, quality assessment, SO₂, physico-chemical analysis, WHO standard.

I. INTRODUCTION

Apples, a highly nutritious fruit, found abundant of essential food elements including fats (11%), carbohydrates (14.9%), sugars (11%), proteins (0.4%) and balanced level of pectin, dietary fibers and potassium, vitamins (A, B and C) and different types of phenolics (1). Apple can be used raw or processed into

juices, jellies, jams, cidar and wine etc. (2). Apple juices act as nutritious beverages and are becoming an important part of the modern diet in many communities, essentially available in the same form almost anywhere in the world (3). Several epidemiological studies suggested the antioxidant and detoxification effect of apple juices in the human body and thus playing role to reduce the risk of chronic degenerative diseases (4,5, 6).

Quality of fruit juices is strictly maintained in developed countries under some law and regulation but in many developing and under developed countries the manufacturer is not concerned about the microbiological safety, hygiene and nutritional importance of fruit juices because of unawareness and lack of legislation (3). Thus the transmission of some human diseases through juice and other drinks are considered a serious problem in these countries today (7).

From our local market survey, it was revealed that although a large number of fruit juices brands (bottles and tetra packs) are available. Some of these juice brands have been found nutritionally low in quality and synthetic. According FDA (2001) reports fruit juices contain water, sugar and natural fruit pulp that could support microbial growth. Several factors encourage, prevent or limit the growth of microorganisms in juices; the most important are pH, hygienic practice storage temperature and concentration of preservatives and water. Industries apply chemical preservatives (including Sulphur Dioxide (SO₂) and benzoate) that can inhibit all types of microbial growth (8). However these preservatives can significantly damage the vegetative cells also. In order to develop awareness among the people about commercial fruit juices nutritional quality and health hazard due to microbial contamination, this study was attempted to measure nutritional and microbiological quality and SO₂ level of industrially processed apple juices available in the local market of Peshawar city.

II. MATERIALS AND METHODS

a) Sample Collection

Different commercially available apple juice samples (Two multinational and four national) were

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collected from the local market of Peshawar city and were labeled with laboratory code Nos. i.e. I (multinational), II (national), III (national), IV (multinational), V (national) & VI (national) respectively. RTS apple juices were analyzed for the following parameters.

b) Physico-Chemical Analysis

Moisture contents of the commercial apple juice samples were determined by direct heating method (9). Total soluble solids of the commercial apple juice samples were recorded by digital Refractometer (Atago Rx-1000) and results were expressed as soluble solids in °Brix (10). Acidity was estimated by titrating diluted samples (1%) against 0.1% NaOH according to the method as described in AOAC (2012) method no. 94.15 (11). The pH was recorded by pH meter (HANNA, HI 2211, pH/ORP meter) by using standard method of AOAC (2012) method no. 2005.02 (12). Reducing and non-reducing sugar (%) were investigated by Lyan and Eynon methods as reported in AOAC (2012) method no. 920.183 & method no. 920.184 respectively (13). Ascorbic acid content (%) of the commercial juice samples was calculated by indophenols titrimetric method as described in AOAC (2012) (9). Total dissolve salts (TDS) in parts per trillion (ppt) of the juice samples was analyzed by digital TDS meter (HANNA, Dist 2 Hi98302) using standard method of AOAC (2012).

c) Sulfur dioxide (SO₂) Residue Determination (g/Kg)

Sulfur dioxide (SO₂) concentration (g/Kg) in apple juices was determined as described by Laboratory manual of agricultural Chemistry, The University of Agriculture, Peshawar (14).

d) Microbial Analysis (cfu/mL)

For microbial evaluation of commercial juice samples Total Viable Count was used, by pour plate method (7). Sample (1 mL) was taken from the three dilutions (10⁻¹, 10⁻² and 10⁻³) and was added to Petri dish. Then Plate Count Agar ((PCA) media was added to each Petri dish. After incubation at 35 °C for 48 hours, colonies were counted by colony counter and results were expressed as cfu/mL.

e) Statistical Analysis

Statistical analysis of results was carried out using CR design. Means of triplicate reading will be represented as mean ± Std.

III. RESULT AND DISCUSSION

a) Physico-chemical Analysis

Physico-chemical properties of different commercial apple juices available in the market of Peshawar city were shown in Table 1. Maximum % moisture contents was observed in sample VI (88.25±1.88) and minimum % moisture content (82.67±1.71) was observed in sample III of commercial

apple juice. Sample I, II, IV and V have moisture content (%) of 84.2±1.13, 86.01±2.01, 83.91±2.17 and 86.12±2.20 respectively. Moisture content affect shelf stability of food samples significantly. Apple juice sample having higher moisture content (%) have low storage life. Of all the samples, sample III has highest TSS 13.1±0.82 followed by sample I (12.23±0.27). In contrast lowest TSS was found for sample VI (1.17±0.15) followed by sample V (2.26±0.05). TSS for samples II and IV are 8.86±0.06 and 10.03±0.20 respectively. TSS for samples III and I fall within acceptable limit of ready to serve drinks (15). PH values for juice samples I to VI were 3.32±0.08, 3.08±0.01, 3.22±0.11, 3.31±0.10, 3.30±0.05 and 3.39±0.05. From pH of juices samples it was clear that sample VI has highest value of 3.39±0.05 and sample II has lowest pH value of 3.08±0.01. Total acidity (%) of the commercial apple juice samples was found in the range of 0.11-0.83. maximum acidity (%) was found for sample I (0.83±0.05) followed by sample III, II and IV (0.68±0.05), (0.24±0.07) and (0.23±0.03) and minimum acidity (%) was found for sample VI (0.11±0.03) followed by sample V (0.14±0.01) respectively. Vit-C contents of the commercial juice samples were ranged from 14% to 26%. Sample III has maximum Vit-C concentration (%) of 26.01±0.05 followed by samples I, II, IV, V and VI having % Vit-C concentration of 23.50±1.83, 22.00±1.02, 20.20±0.33, 20.00±0.02 and 14.00±0.10. Total dissolve solids (TDS) of the commercial apple juice samples (I-VI) were recorded in the range of 0.84 to 0.23. highest TDS was found for sample I (0.84±0.03) and lowest for sample II 0.23±0.01. Recorded TDS for samples III to VI was 0.67±0.11, 0.48±0.08, 0.56±0.10 and 0.48±0.22. Reducing sugar (%) was found highest in sample I (21.45±0.93) followed by sample III (20.20±0.51), IV (18.3±0.43) and II (8.46±0.55). in contrast, in juice samples V and VI no content of reducing sugar was found. Like reducing sugar (%), non-reducing sugar (%) contents were also found 0.00 in sample V and VI. Sample I contained highest concentration (2.1±0.74) of non-reducing sugar followed by sample III (1.81±0.15). While sample II and IV has 0.26±0.06% and 0.93±0.20 % of non reducing sugars.

b) Sulfur Dioxide (SO₂) residue determination (g/Kg)

Sulfur dioxide concentration of juice samples (I to VI) were 0.01±0.02, 0.10±0.00, 0.01±0.01, 0.05±0.00, 0.10±0.02 and 0.17±0.09. According to WHO standard, MRL (maximum Residual Limit) for SO₂ in juices is 0.03 g/Kg. Of all the selected juice samples, only samples I (multinational) and III (national) showed SO₂ residues concentration less than 0.03 g/Kg (i.e. 0.01±0.02 and 0.01±0.00 respectively) and were found suitable for human consumption. All other samples were proven toxic and need to neglect its consumption (Table 1). Consumption of SO₂ above standard limits

(0.03g/Kg) damage vegetative cell, cause stomach upsetting and various types of allergies (FAO/WHO, 1999).

Table 1: Physico-chemical and SO₂ residue analysis of commercial juice samples available in the market of Peshawar City

Parameters	Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI
Moisture %	84.2±1.13	86.01±2.01	82.67±1.71	83.91±2.17	86.12±2.20	88.25±1.88
TSS Brix°	12.23±0.27	8.86±0.06	13.1±0.82	10.03±0.20	2.26±0.05	1.17±0.15
pH 32.4 °C	3.32±0.08	3.08±0.01	3.22±0.11	3.31±0.10	3.30±0.05	3.39±0.05
Acidity %	0.83±0.05	0.24±0.07	0.68±0.05	0.23±0.03	0.14±0.01	0.11±0.03
Vit-C %	23.50±1.83	22.00±1.02	26.01±0.05	20.20±0.33	20.00±0.02	14.00±0.10
TDS ppt	0.84±0.03	0.23±0.01	0.67±0.11	0.48±0.08	0.56±0.10	0.48±0.22
Red.sugar%	21.45±0.93	8.46±0.55	20.20±0.51	18.3±0.43	0.00±0.00	0.00±0.00
Non-reducing sugar %	2.1±0.74	0.26±0.06	1.81±0.15	0.93±0.20	0.00±0.00	0.00±0.00
SO ₂ (g/Kg)	0.01±0.02	0.10±0.00	0.01±0.01	0.05±0.00	0.10±0.02	0.17±0.09

c) Microbial Analysis

Total viable count (CFU/mL) concentration was 30, 21, 15, 6, 4 and 2 for sample VI, V, II, III, IV and I. Coliform bacteria population was less than 1.1 for all samples. No evidence of E.coli was found in all selected juice samples (Table 2). According to WHO standard of

drinking water (total viable count = < 100, coliform bacteria < 1.1 and E.coli 0157:H7 = nil), commercial apple juices present in the local market of Peshawar City are suitable for human consumption, from microbial point of view.

Table 2: Microbial analysis of commercial juice samples available in the market of Peshawar City

Parameters	Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI
Total viable count (cfu/mL)	2	15	6	14	21	30
Coliform bacteria (MPN/100mL)	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
E.coli	Nil	Nil	Nil	Nil	Nil	Nil

IV. CONCLUSION

From this study it was observed that sample III (national) followed by sample I (multinational) of the selected apple juices is more suitable for human consumption. In contrast, human usage of samples VI and V is not good physico-chemically. Similarly all samples were found acceptable for human's consumption from microbial point of view and fall in the range of WHO standards.

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Compliance to Prenatal Iron and Folic Acid Supplement and Associated Factors among Women during Pregnancy in South East Ethiopia: A Cross-Sectional Study

By Mekonnen Tegegne, Haile Woldie & Abera Biratu

Madda Walabu University

Abstract- Background: Nutritional anemia is one of the leading causes of morbidity and mortality among pregnant women in developing country. Several studies have shown that prenatal iron and folic acid supplement for three months and more during pregnancy plays a great role in preventing maternal morbidity and mortality. The aim of this study was to assess compliance of prenatal iron and folic acid supplement and its associated factors during Antenatal Care in Goba District South East Ethiopia.

Methods: A community based cross-sectional study was conducted from March to May, 2014 in Goba District. A total of 405 mothers who give birth in the last six months were selected using systematic random sampling technique. Data were collected using pretested questionnaire by interview and then entered and analyzed using SPSS version 20. Both Bivariate and multivariate logistic regression were carried out to see significant association. Variables with P-value less than 0.05 were considered as significant in the multivariate analysis. Results: The compliances rate to IFA supplement was found out to be 18%. Educational status of mother (AOR=0.24 (95% CI 0.63-0.97)), knowledge on anaemia (AOR =0.41 (95% CI 0.20-0.84)), knowledge on benefit of iron folic acid (AOR =0.38 (95% CI 0.20-0.77)), receiving health education on Iron Folic acid supplement during prenatal visit (AOR= 4.03 (95% CI 1.4-11.5)) were found to be factors associated with compliances to iron folic acid supplement.

Keywords: iron, folic acid, compliances to IFA, women, southeast Ethiopia.

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Mekonnen Tegegne^α, Haile Woldie^σ & Abera Biratu^α

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Conclusions: Compliance to IFA supplement was low among the study communities. Improving awareness of the community about IFA supplement during pregnancy and improving educational status of women are highly recommended.

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I. BACKGROUND

Anemia is a global public health problem affecting two billion people worldwide. Globally, 41.8% of pregnant women and 30.2% of non-pregnant women are anemic (1). At least half of this anemia

burden is assumed to be due to iron deficiency (2). Many studies documented the adverse effects of maternal anemia, 12.8% and 3.7% of maternal mortality in Asia and Africa respectively is directly attribute-able to anemia (3). In Ethiopia; anemia is the severe problem affecting 62.7% of pregnant mothers and 52.3% non-pregnant women (4, 5). For women, the consequences of anemia include reduced energy and capacity for work poor pregnancy and birth outcomes including premature delivery, low birth weight, and increased prenatal mortality, and increased risk of death during delivery and postpartum. It is estimated that as many as 20% of maternal deaths are caused by anemia and that anemia may be an associated cause in as many as 50% of maternal deaths worldwide(6).

As a public health measure, iron/ folic acid supplementation has been the recommended strategy for alleviating anemia in pregnant women. WHO recommended daily dose of 30–60 mg of elemental iron and 400 µg (0.4 mg) Folic acid on daily bases throughout pregnancy(7).

To combat Iron deficiency anaemia, many developing countries including Ethiopia have interventions and programme during pregnancy. Provision of IFA supplement to all pregnant women free of charge is among the key interventions. The recommended dose by the Ministry of Health in Ethiopia is 60 mg/day for 90 days for iron and 400µg of folic acid daily(8, 9). And, Although National Nutrition Strategy adopted key target of increasing the proportion of mothers who get IFA for more than 90 days during pregnancy and the post-partum period to 50% by 2015, there is discrepancy in the ANC coverage and the IFA intake level. The 2011 DHS documented IFA supplement of 17%. More importantly the IFA intake 90 or more tablets found to be 0.4% (18).

Gastrointestinal side effects, inadequate Supply of tablets, inadequate counselling, poor utilization of prenatal health-care services, lack of knowledge and patient fears about the tablets affect women's perception regarding tablet use in many countries (11-14).

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Even though iron folic acid (IFA) Supplementation during pregnancy is among the methods to reduce maternal mortality, in Ethiopia the coverage is very low, in addition there are limited studies conducted on this topic.

Therefore, the findings of this study will give valuable information on compliances of IFA and its determinate factors for policy makers and service providers.

II. MATERIALS AND METHODS

A community based cross-sectional study using quantitative methods of data collection was conducted in Goba District, South East Ethiopia from March to May 2014.

Those postnatal mothers who give birth 6 months before the survey were included in the study. The sample size for this study was determined using a single population proportion formula estimation, with the assumptions of; an expected compliances to IFA 50%, a 95% confidence level, a 5% margin of error and a none response rate of 10%. The final calculated sample size was 422.

Goba district is divided into 2 urban and 24 rural kebeles (the smallest administrative unit in Ethiopia). From the district's 24 rural kebeles 4 were selected randomly and from the 2 urban kebeles 1 is selected randomly. In selected kebeles, preliminary survey was conducted to identify households with mothers who have child birth within 06 months prior to the study and sampling frame was developed. After the total sample size was allotted proportionally to the selected kebeles based on the total number of deliveries in the past 06 months, respondents were selected using systematic random sampling technique.

Data was collected using semi-structured, interviewer administered, pretested questionnaire after Obtaining informed consent. The completed questionnaire were given codes, checked for completeness and consistencies then entered into EPI-info version 3.5.3 statistical software and then transferred to SPSS version 20 statistical package for further analysis. Data cleaning were performed to check for accuracy and consistencies, missed values and variables were also checked and corrected. The results were presented in the form of tables, figures, and text.

In this study, women were categorized as compliant to IFA supplement if she took 90 or more IFA tablets on daily base during her pregnancy (20).

Mothers Knowledge of anaemia was assessed using 20 questions. The questionnaire were composed of cause, health consequence, risk group and method of prevention in anaemia, Mothers who score mean value and above were considered as having good knowledge of anemia.

To assess mother's knowledge of IFA, 12 questions were employed, mothers who score mean value and above were considered as having good knowledge of IFA.

Both Bivariate and multivariate logistic regressions were used to identify factors associated with compliances to IFA. Odds ratio with 95% confidence interval was used to identify the presence and strength of association between variables.

Ethical clearance was obtained from the Institutional Ethical Review Board of Institute of Public Health, College of Medicine and Health Sciences, University of Gondar. Correspondingly written letters were offered from Bale Zone Health Department. Finally informed consent was obtained from each mother before the start of the interview.

III. RESULTS

a) *Socio-demographic Characteristics*

A total of 405 PNC mothers who give birth 6 months before data collection were included in the study with a response rate of 95.9%. The mean age of the respondents was 26.3 (± 5.1) years. Around 35.6% of respondent were in age group of 21-25 years and about 28% were in age group of 36-40 years.

Majority of the women interviewed were married (98.1%) and rural dwellers (83.2%). About (32.1%) of the respondents were unable to read and write, (27.4%) can only read and write, (13%) had primary school level and (19.5%) had secondary school level. Regarding occupation majority of the respondents were house wives (72.6%) (Table1).

b) *Pregnancy and Obstetric related characteristic of respondent*

Around half of the respondents had less than three times ANC visit. Around eleven percent of the respondents had history of abortion and 3% had history of still birth. Among the respondents 21.7% started ANC while their pregnancy was less than 12 weeks of gestation, and 26.7% started after 24 weeks of gestation (Table2).

c) *Respondent's knowledge about anemia and benefit of IFA supplement*

Two third (62.5%) of respondents had good knowledge on cause, consequence, risk group, and method of prevention in anaemia, while 60.7% of the respondents had good knowledge on benefits of IFA.

d) *Service related characteristics*

About 78.9% were provided with health education and 21.1% were not provided health education on iron/folic acid supplements during their IFA collection. . Regarding dispensing of supplement; majority of the respondents (87%) collected 30 tablets whereas 12.8% were collected more than 30 tablets per visit (Table 4).

e) *Compliances to iron/folic acid supplement*

It was found out that only 18% of the respondents were compliant to iron/folic acid supplement.

f) *Factors Associated with Adherence*

Bivariate analysis for compliances to IFA revealed that place of residence, educational status of mother, education level of the husband, mothers knowledge of anaemia, mothers knowledge on benefits of iron folic acid and receiving health education at the time of supplement collection have significant association with compliance to IFA at $p \text{ value} \leq 0.02$.

Multivariable logistic regression was done to control potential confounders and educational status of mother, knowledge on anaemia, knowledge on benefits of iron folic acid and receiving health education at the time of supplement collection have significant association with compliances to IFA at $p \text{ value} \leq 0.05$ (Table 5).

IV. DISCUSSION

This study revealed that only 18% of the studied subjects were compliant to IFA supplement.

The compliance rate of this study is lower than a study conducted in Kenya (24.5% (15)), study conducted in Cambodia (47%) (16) and study conducted in India (35.5%) (17). This could be due to differences in socioeconomic status of the study population. But the finding of this study is higher than EDHS 2011 which was 0.4%. This could be because of the present study has been conducted among ANC follower and the time gap between the present study and EDHS 2011 (18).

Educational status of mother was important socio demographic factor which showed significant association. The compliance rate of IFA supplement was significantly increases with educational status of mother. Mothers who can't read and write were 91%, mothers who can read and write were 77% and mothers who had primary education were 76% less likely to adhere to IFA when compared with those who had above secondary education. This might be because, when women are educated, they might have accessible to information and advices from different sources about IFA and threats of anaemia.

Another important variable that showed a significant association is knowledge of cause, consequences, risk group and method of prevention in anemia. The rate of compliance to IFA was 59% times less likely among women with poor knowledge.

This finding was similar with the study done in Nepal which identifies high proportion of compliances among pregnant mothers with good knowledge (19). This could be due to reason that knowledge of pregnant women about anaemia related to causes, consequence and method of prevention affect their compliance of IFA.

In addition good level of knowledge about anaemia was a factor which could promote individuals in preventing iron deficiency anaemia and following recommendation.

It was found out that there was a significant association between respondent's knowledge on benefit of IFA and compliance to IFA. Women with poor knowledge on benefit of IFA were 62% times less likely to adhere than women's with good knowledge on benefit of IFA. This could be due to the fact that good levels of knowledge promote mothers to take the supplements based on the recommendation.

Receiving health education during prenatal visit was also an important predictor of compliance to iron foliate supplements. This study showed that mothers who were provided with health education at the time of receiving supplements have about 4.03 (AOR 4.03 (95% CI 1.4- 11.5) times more likely to adhere to IFA supplement than those who were not provided. This could be due to the fact that health education at the time of supplement provide important information of IFA supplement

V. CONCLUSIONS

Compliance to IFA supplements was low among pregnant women attending ANC in the study communities. Increase awareness of the community about anemia and IFA supplement during pregnancy, improving educational status of women, providing alternative community based delivery mechanisms and sustainable supply of IFA is highly recommended.

a) *Abbreviations*

ANC: Antenatal Care; *EDHS*: Ethiopian demographic and health Survey; *IDA*: Iron deficiency anaemia; *IFA* iron / folic acid; *MMR*: maternal mortality rate; *NIE*: nutritional initiative of Ethiopia; *PNC*: postnatal care; *SPSS*: statistical package for social science; *WHO*: world organization.

b) *Competing Interests*

The authors declare that they have no competing interests.

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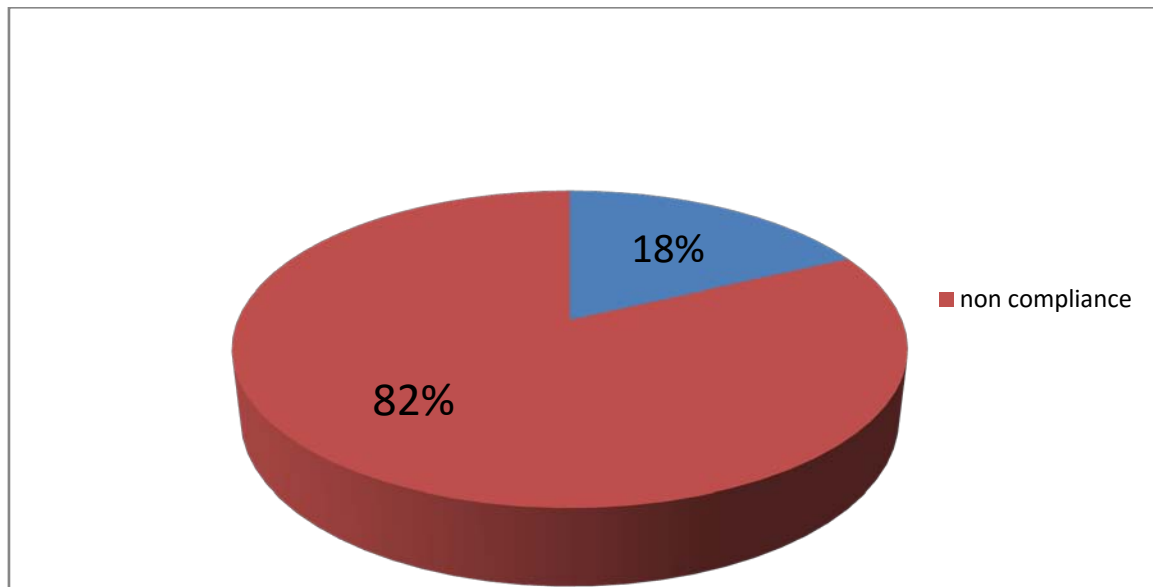


Figure 1: Adherence level of mothers to IFA Goba District South East Ethiopia, 2014

Table 1: Socio-demographic and economic characteristics of respondent of pregnant and PNC mothers, Goba woreda, South East Ethiopia, 2014 (n=405)

Variable	Category	Frequency	Percent
Age	16-20	51	12.6
	21-25	144	35.6
	26-30	132	32.6
	31-35	50	12.3
	36-40	28	6.9
Marital status	single	15	3.7
	Married	370	91.3
	Divorced	4	1.0
	widowed	16	4.0
Religion	Orthodox	174	43.0
	catholic	6	1.5
	Muslim	213	52.6
	protestant	12	3.0
Residence	rural	337	83.2
	Urban	68	16.8
Family size	< 4 family	71	17.5
	4-7 family	253	62.5
	>7 Family	81	20.0
Educational level	Can't read and write	122	30.1
	Can read and write	117	28.9
	Primary	53	13.1
	secondary	84	20.7
	Above secondary	29	7.2
Occupation of mother	House wife	294	72.6
	Governmental employee	41	10.1
	Private employee	18	4.4
	Daily laborer	11	2.7
	Merchant	24	5.9
	Farmer	17	4.2

Educational level of husband	Can't read and write	80	19.8
	Can read and write	116	28.6
	Primary	59	14.6
	secondary	117	28.9
Occupation of husband	Above secondary	33	8.1
	Governmental employee	58	14.3
	Private employee	47	11.6
	Daily laborer	12	3.0
	Merchant	27	6.7
	Farmer	261	64.4

Table 2: Pregnancy and obstetric related characteristic of respondent Goba woreda, Oromia region, South East Ethiopia, 2014(n=405)

Variable		Frequency	Percent
Gravidity	<3	302	74.6
	≥3	103	52.4
Still birth	Yes	12	3
	No	393	97
Abortion	Yes	47	11.6
	No	358	88.4
No of ANC	>3	199	49.1
	≤3	206	50.9
Time of start of ANC	<12 week	88	21.7
	12-24wk	209	51.6
	>24 wk	108	26.7
	Health post	73	18
Place of ANC	Health Center	277	88.4
	Hospital	55	13.6

Table 3: Respondents knowledge about anaemia and benefit of IFA supplement Goba District, South East Ethiopia, 2014 (n=405)

Variable		Frequency	Percent
Knowledge on anaemia	Good knowledge	253	62.5
	Poor knowledge	152	37.5
Knowledge on benefits of IFA	Good knowledge	246	60.7
	Poor knowledge	159	39.3

Table 4: Service related characteristics Goba District, South East Ethiopia, 2014 (n=405)

Variable	Category	Frequency	Percent
Health education	Yes	319	78.8
	No	86	21.2
Waiting time	< 30 minute	354	87.4
	>30 minute	51	12.6
Problem faced	Yes	93	23
	No	312	77
Number of tab supplemented per visit	30 tab	353	87.2
	>30 tab	52	12.8

Table 5: Factor associated with compliance to IFA at Goba District, South East Ethiopia, 2014 (n=405)

Factors	Category	Compliance status of respondent		COR (95 % CI)	AOR (95 % CI)
		Compliance	Non-Compliance		
Place of residence	Rural	54	283	0.49(0.26, 0.90)	0.69(0.31, 1.5)
	Urban	19	49	1	1
Educational status of mother	Can t read and write	9	113	.20(0.7, 0.60)	0.11(0.026, 0.47)
	Can read and write	20	97	.54(.21, 1.39)	0.23(0.064, 0.87)
	Primary education	8	45	0.46(0.15-1.4)	0.24(0.63, 0.97)
	Secondary education	28	56	1.31(0.51, 3.33)	0.97(0.32, 2.8)
	Above secondary	8	21	1	1
Educational status of husband	Can t read and write	10	70	0.38(0.13, 1.04)	1.31(0.34, 4.9)
	Can read and write	16	100	0.42(0.16, 1.08)	1.30(0.37, 4.4)
	Primary education	13	46	0.75(0.28, 2.75)	3.3(0.90, 12.3)
	Secondary education	25	92	0.72(0.29, 1.75)	0.85(0.30, 2.3)
	Above secondary	9	24	1	1
History of abortion	Yes	15	32	2.4(1.23, 4.7)	3.79(1.68, 8.55)
	No	58	300	1	1
Knowledge on anemia	Good	58	195	1	1
	Poor	137	15	0.36(0.20, 0.67)	0.41(0.20, 0.84)
Knowledge on benefits of iron folic acid	Good	56	190	1	1
	Poor	17	142	0.40(0.22, 0.72)	0.38(0.20, 0.77)
Health education at the time of supplement collection	Yes	68	251	4.3(1.71, 11.2)	4.03(1.4, 11.5)
	No	5	81	1	1



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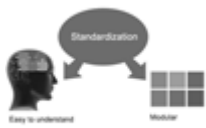
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19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

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21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.



27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.



Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

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Mistakes to evade

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- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

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- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

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- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
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- If use of a definite type of tools.
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- Report the method (not particulars of each process that engaged the same methodology)
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- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
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The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently. You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.



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- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
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- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
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- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
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- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.



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<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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