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Highlights

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VOLUME 16 ISSUE 1 VERSION 1.0



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A Therapeutic Role for Diet in the Treatment of Crohn's Disease?

By Gilles R. G. Monif, M.D.

Abstract- An unintended experiment in veterinary medicine and its follow up analysis have identified the ability for dietary supplements that enhance cellular immunity to destroy *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The possible significance of this observation for Crohn's disease is discussed.

An infectious disease is basically a statement of immune system failure. Either the pathogen's challenge inoculum was too great for the host's immune system to subjugate or the host's immune system was genetically designed to facilitate susceptibility to the mycobacterial pathogen in question. Within the *Mycobacterium avium* subspecies *paratuberculosis* (MAP) paradigm of causation of Crohn's disease, diet's therapeutic objectives have been reduction of MAP antigen challenges and the correction of diseased induced impairment of host immunity (1-3). The argument is presented that specifically targeted dietary supplementation may be therapeutic.

Keywords: *crohn's disease, diet, mycobacterium avium subspecies paratuberculosis.*

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A Therapeutic Role for Diet in the Treatment of Crohn's Disease?

Gilles R. G. Monif, M.D.

Abstract- An unintended experiment in veterinary medicine and its follow up analysis have identified the ability for dietary supplements that enhance cellular immunity to destroy *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The possible significance of this observation for Crohn's disease is discussed.

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Keywords: crohn's disease, diet, mycobacterium avium subspecies paratuberculosis.

I. REDUCTION/ELIMINATION OF MAP ANTIGEN CHALLENGES

The ability of immunomodulators and biologics to induce temporary remission had previously formed the foundation for the autoimmunity paradigm of causation. The current thesis of causation is that Crohn's disease is due to the interplay of two *Mycobacterium avium* subspecies *paratuberculosis* (MAP) mediated immunologically interactions (1,2). In the absence of acquired immunity, MAP causes fixation of the pro-inflammatory response that curtailed the infection. When the individual is subsequently MAP re-challenged, rather than exhibiting immune tolerance, the immune system again elaborates cytotoxic cytokines targeted against MAP. Unlike other mycobacterial diseases, MAP can't be identified within diseased tissues; nevertheless, MAP's DNA can be detected. This subliminal presence of MAP as spheroclasts is theorized to be the antigen template that sustains the anti-MAP cytokine cascade elicited upon re-exposure to MAP (2, 3). In contrast to bacteria, occult sequestration of viruses and mycobacteria has been advanced to account for the persistence of immune markers for years after the initial infection (4). This persistence of specific antibodies is not a uniform occurrence in all cases, suggesting that, in some cases, immune destruction of the antigenic template has been achieved.

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II. IMMUNE SYSTEM ENHANCEMENT BY DIET

Prior to the advent of anti-mycobacterial drugs, the therapeutic modalities that could sometimes affect a clinical cure for infections due to *Mycobacterium tuberculosis* were stress reduction (negation of the effect of stress on the immune system), sunlight (correction of vitamin D deficiency), and nutrition (replacement of essential ingredients for optimum function of the immune system).

Unlike bacterial diseases, immunological and serological markers for mycobacteria and viruses may persist in some individuals for years after the initial infection. (4). When cell-mediated immunity is effectively compromise reactivation of organism replication may occur. in individual who retain immunological evidence of prior infection. The loss of immunological markers is presumed to correlate with destruction of its template.

Johne's disease is a reputedly incurable chronic granulomatous disease of the gastrointestinal tract caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). Once a cow manifests with full blown liquid diarrhea associated with evidence of advanced malnutrition, death usually occurs in the ensuing two to three weeks. Just such a cow was removed from its herd and placed in a controlled, stress free environment. In order to obtain additional quantities of high-titer anti-MAP antibodies, the animal was put on boutique designed supplements composed of vitamins, minerals, and selected amino acids that targeted enhancing cellular immunity.

The animal thrived. During the four months of targeted dietary supplementation, her serological markers fell to near normal. When she was necropsied, neither gross nor histological evidence of MAP/Johne's disease were identified (5). Histological analysis of the diseased tissues identified the mechanism of MAP destruction (6).

The demonstrated ability of targeted dietary immune system enhancement to destroy MAP in Johne's disease makes a theoretical case for potential therapeutic synergy with anti-MAP drugs. Destruction of the MAP template required for the production of MAP targeted cytokines may be the requisite for transforming prolonged remissions into cures.

In Crohn's disease, MAP's DNA can be detected within diseased tissue, but MAP per se can't be identified. A secondary corollary of the Hruska

Postulate is that the subliminal presence of MAP in spheroclastic form constitutes the template for anti-MAP cytokine (7). immunity.

Acquitted immunity is primarily derived from the symbiotic microbiological flora within the gastrointestinal tract. Once an individual experiences diarrhea of any etiology for a sustained period of time, his or her immune system becomes progressively compromised. Inflammatory changes and cell death alter the local microbiological environment and the inter-relationships within the governing bacterial hierarchy. Facultative anaerobic pathogenic bacteria escape the imposed suppression by dominant anaerobic bacteria. The governing symbiotic bacteria are replaced by more pathogenic organisms theoretically adversely affect gut acquired immunity. In Crohn's disease, the mucosal destruction and inflammatory infiltration of the lamina propria further impeded absorption of key elements needed to sustain an optimally functioning immune system.

Four of the nine ingredients included in cow #6142's dietary supplementation to counter disease-imposed deficiencies are discussed.

Zinc: The body has no specialized system to store zinc. (8). Individuals with Crohn's disease very probably have zinc deficiency impairment affecting a broad spectrum of mechanisms involved in the killing of intra-cellular pathogens. Zinc generates oxidants that destroy viruses and mycobacterium (9). The zinc deficiency further sustains selective malnutrition through induced loss of appetite. With infection, a redistribution of zinc occurs. Interleukin-1 (IL-1) tumor necrosis factor (TNF) and interleukin-6 (IL-6) cause a marked decrease in serum zinc concentration (10), Crohn's disease can result in decreased zinc absorption and increased exogenous zinc loss (11).

Zinc is required for the catalytic activity of approximately 100 enzymes involved with immune function and protein and DNA synthesis. Zinc deficiencies result in adverse changes in cytokine production and T-cell subpopulations (12).). With infection, a redistribution of zinc occurs. Interleukin-1 (IL-1) tumor necrosis factor (TNF) and interleukin-6 (IL-6) cause a marked decrease in serum zinc concentration (13).

Even mild to moderate degrees of zinc deficiency can impair macrophage and neutrophil functions, natural killer cell activity and complement function. (13) The body requires zinc to develop and activate T-lymphocytes (14). Zinc is a critical component of the thymic hormone, thymosin that regulates cell-mediated immunity. With prolonged zinc deficiency, thymic atrophy and lymphoid depletion of the spleen and lymph nodes occurs (14, 15).

Among the major functional consequences of zinc deficiency are anorexia, diarrhea, and impaired

immunological responsiveness. Zinc deficient individuals with significant diarrhea often have very high zinc loss in their feces.

The recommended daily amount of zinc recommended for health maintenance (15mg) is inadequate when systemic infection/disease is present and is totally inadequate with diarrhea.

Selenium: Selenium is an essential component of selenocysteine proteins within the immune system. Selenium is incorporated as selenocysteine into selenoproteins, one of which, glutathione peroxidase is considered essential in antioxidant defense mechanisms. Selenium dependent glutathione peroxidases protect neutrophils from oxygen-derived radicals. Selenium acts as an anti-oxidase in the extra-cellular space, the cell cytosol, in association with cell membranes in the gastrointestinal tract. (16) The selenium based antioxidants remove potentially damaging lipid hydroperoxidases and hydrogen peroxide and are considered essential in sustaining mucosal integrity. Selenium has been demonstrated to improve the killing ability of neutrophils (16).

Herds grazed on selenium poor soil have a high incidence of Johne's disease (a chronic granulomatous disease caused by MAAP) in comparison to those animals pastured on ground with good selenium levels. (17) Vitamin E deficiency is frequently concomitantly present in selenium deficient animals (18). Deficiency of selenium undermines the integrity of the gastrointestinal mucosa by facilitating the action of pro-inflammatory compounds. In dairy cattle, deficiencies of selenium can cause poor growth and diarrhea (19). Individuals receiving zinc 20mg per day plus of selenium and 100ug per day plus anti-oxides appear to acquire fewer infections (20).

Vitamin D: Vitamin D3's active form, calcitriol, plays an important role in cell differentiation and proliferation of the immune system. Vitamin D inhibits B cell proliferation and blocks B cell differentiation and immunoglobulin secretion. It suppresses cell proliferation resulting in a shift from a TH1 to TH2 response and skewing T cell maturation away from TH17 (21, 22) It inhibits monocyte production of pro-inflammatory cytokines IL-1, IL-6, IL-8 IL-12 and TNF alpha. (23)

A role for vitamin D in Crohn's disease had been inferred by published individual testimony. The amelioration of symptomology to actual transient remission has been observed following vitamin D supplementation. Previously, a therapeutic benefit had been inferred by exposing to sunlight individuals suffering from *Mycobacterium tuberculosis* infection. Vitamin D-rich cod liver oil has been used as a treatment for mycobacterium-induced infections.

As long as therapy of Crohn's disease functioned under the shadows of the autoimmunity paradigm, the acceptable therapeutic outcome

remained fixed at temporary disease palliation: arrestment of symptomology, with evidence of mucosal healing. The dysbiosis paradigm identified the second mechanism resulting from immune destruction of selected areas within the small bowel. The addition of antibiotics increases the number of remissions attained with biologics. The utilization of focused anti-MAP therapy has produced longer remission than had previously been attained with biologics or immunomodulatory. Cow 6142 has added an additional therapeutic vehicle: auto-enhancement of MAP destruction through diet and of reduction the adverse effect of stress on the immune system.

Vitamin C: Vitamin C regenerates vitamin E from its oxidized form. The lipid soluble antioxidant vitamin E not only protects the integrity of cell membranes, but functions synergistically with other nutritional elements that beneficially influence cell-mediated immunity. The salvage of vitamin E influences the immune functions of selenium which in turn has a beneficial impact on copper and zinc utilization (24). The body's need for vitamin C dramatically increases with infection/disease (25-28). Mega-doses can prevent and/or greatly speed the recovery from acute viral infections (29-30).

III. DISCUSSION - DESTRUCTION OF THE MAP TEMPLATE

The Hruska Postulate and its modifications now constitute "error-up-to date" with respect to the pathogenesis of Crohn's disease. The incorporation of anti-MAP therapy into the treatment of Crohn's disease has resulted in remissions of longer durations than had been achieved with biologics, but also alleged cures (31-35). Warren et al. have noted the remission of Crohn's disease in individuals with tuberculosis who were treated with anti-tuberculosis therapy (36). In tuberculosis, pharmaceutical destruction of *M. tuberculosis* acted primarily to reduce the pathogen mass to a quantum that allowed the host's cell-mediated immune system to achieve governance and sometime cure.

In the mid 1980s, Warren et al. described remission of Crohn's disease with anti-tuberculosis therapy (31). The implication of this experiment in medical care ultimately manifested a decade and a half later when Borody et al., Chamberlin et al., and Shafran et al., among others, incorporated anti-tuberculosis drugs into their therapeutic regimens for Crohn's disease (32-36). The importance of addressing therapy against the MAP template has been inferred by both statistical evidence derived from meta-analyses of multiple formal studies and documented clinical and endoscopic responses in patients treated with anti-MAP combinations outside of formal clinical studies (36). Conversion of prolonged remissions to cure may require

complete destruction of the sustaining immune template.

In Crohn's disease, the role of diet can go beyond reversing the induced catabolic state and reducing the number of MAP antigen challenges. In a concerted effort to destroy the sustaining MAP template in Crohn's disease, diet has the potential to be a synergistic therapeutic vehicle to anti-mycobacterial drugs. This demonstrated ability to, not render MAP inactive but to actually destroy the organism (5,6), introduces the potential of changing the therapeutic target in Crohn's disease from remission to cure.

IV. CONCLUSION

Cow #6142 has demonstrated that targeted dietary supplementation can affect destruction of MAP. This cow makes the case for dietary synergy with anti-MAP drugs in order to break the MAP template that is required for the elaboration of MAP targeting cytokines

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Nutritional Status and Associated Factors of Adolescent School Girls, Goba Town, Southeast Ethiopia

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Methods and procedure: An institution based cross sectional study design was employed. A total of 598 adolescent school girls were selected using simple random sampling methods. Data were collected using interviewer administered questionnaire and anthropometric measurements. Anthro-metric measurements were converted to height-for age z-scores and BMI-for-age z-scores using WHO Anthroplus software. The nutritional status of the study subjects were classified as stunted ($HAZ < =2SD$) and thin ($BAZ < -2 SDD$). Data were Analyzed using SPSS version 20.0. Descriptive statistics was done. Binary logistic regression was used to identify factors associated with stunting and thinness.

Keywords: *adolescents girls, nutritional status, stunting, thinness.*

GJMR-L Classification: *NLMC Code: WT 115*



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Nutritional Status and Associated Factors of Adolescent School Girls, Goba Town, Southeast Ethiopia

Mekonnen Tegegne ^α, Semere Sileshi ^σ, Tesfaye Assefa ^ρ & Abdurrahman Kalu ^ω

Abstract- Background: Despite the fact that, Having adequate information on the nutritional status of adolescent girls do have paramount importance to foster a healthy transition from childhood to adulthood and to broken the intergenerational cycle of malnutrition, in Ethiopia particularly in the study area information regarding the nutritional status of adolescents is lacking.

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Results: The overall prevalence of thinness and stunting among school adolescent girls was 11.9% and 20.9 % respectively. Early adolescent girls (age <=14) were 1.7 (AOR =1.7, 95% CI: 2.2 – 19.1) times more likely to become thinner as compared to late adolescent girls (age >=14). Adolescent girls whose mothers had no formal education were 9.6 (AOR=9.6 CI: 2.6-23.3), mothers who can read and write were 7.6 (AOR =7.6, 95% CI: 2.2 – 19.1) and mothers who had primary education were 5.2 (AOR= 5.2, 95%CI: 1.4 – 17.4) times more likely to be thin as compared to those mothers who had college and above education level. Adolescent girls with inadequate dietary diversity score were 2.7 (AOR =2.7, 95% CI: 1.5-5.04) times more likely to be stunted as compared to their counterparts.

Conclusion and recommendation: The overall prevalence of thinness and stunting in the study area is high. Age of respondent's, educational status of mother and dietary diversity scores were factors associated with thinness and stunting. School-based nutrition program that focus on

diversified diet consumption and promotion of women education is highly recommended.

Keywords: adolescents girls, nutritional status, stunting, thinness.

I. BACKGROUND

World Health Organization (WHO) defined adolescent as the period of life from 10 to 19 years. Adolescents constitute 20% of the world population and about 25% of the populations of Ethiopia are adolescent.

This period is very crucial since it is the formative years in the life of an individual when major physical, psychological and behavioral changes take place (1, 2, and 3). During this period, adolescents gain up to 50% of their adult weight, 20% or more than that of their adult height and 50% of their adult skeletal mass. Owing to these, nutritional requirements at this period are maximal, combined with poor eating habits and other considerations, e.g. menstruation, contribute to accentuating the potential risk for adolescents under nutrition (4, 5).

Malnutrition is associated with significant morbidity, mortality, and affects the reproductive outcome in adolescent girls. Moreover, undernourished adolescents tend to be ultimately malnourished adults, give birth to small babies, and transmitting under nutrition to future generation (6).

In general adolescent girls are the worst sufferers of the ravages of various forms of malnutrition because of their increased nutritional needs and low social power (7).

Like other developing countries of the world, under nutrition remains a major public health problem in Ethiopia. Among the women, 17 % had chronic energy deficiency (BMI < 18.5), 6 % had experiencing night-blindness in their most recent pregnancy, 27 % had anemia. This clearly reflects that rate of malnutrition in Ethiopia is high (8).

Despite the fact that, Having adequate evidences and information on the prevalence of stunting and thinness and associated factors among adolescent girls do have paramount important for planning, initiating and implementing of intervention programs to broken the intergenerational cycle of malnutrition and to to foster a healthy transition from childhood to adulthood,

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information regarding the nutritional status of adolescents in the study area is lacking.

Therefore, the study sets out to address the issues related to prevalence rate of underweight and stunting and its associated factors among adolescent girls in Goba town, south East Ethiopia.

II. METHODS

a) Study design and period

Institution-Based Cross-sectional Study was employed from March to June 2015.

b) Study Area

This study was conducted in Goba town, South East Ethiopia. Goba town is situated at 445km south east from the capital Addis Ababa. In the town, currently there are 21 schools of which 11 are governmental and 10 are privates. In the town there are One Referral Hospital and two health centres.

c) Sample size determination and sampling Methods

The sample size was calculated using single population proportion formula by considering the following assumptions. Proportion of adolescents with thinness ($p = 58.3\%$) from previous study done among rural adolescent girls in Tigray, Margin of error as 5%, confidence level at 95 %, non response rate of 10 % and design effect 1.5. The final sample size for this study was 617.

A total of 617 adolescent girls were selected from both governmental and private schools. Subjects were selected by stratifying the total schools into governmental and nongovernmental schools. Then, two primary and one high school from governmental schools and two primary school from private schools were selected using lottery method. Then the study subjects were stratified per study classes and determined sample size was allocated proportionally. Finally, Simple Random Sampling was used to selected study subjects from respective classes using the registrar record as the sampling frame.

d) Study variable

Dependent variables: Thinness and Stunting are Dependent variables of this study.

Independent variables: Independent variables includes Demographic and Socio –Economic Characteristics, Health and Household Environment related characteristics and Meal pattern and Dietary diversity score related characteristics

e) Operational definition

Adolescents: Individuals in the age group of 10-19 years of age (1).

Thinness: BMI-for-age below the 5th percentile of the 2007 WHO reference population (18).

Stunting: Height-for-age below -2Z scores of the 2007 WHO Reference population (18).

Adequate Dietary Diversity: Proportion of adolescent girls who received mean values or above of foods from nine food groups (20).

Inadequate Dietary Diversity: Proportion of adolescent girls who received less than mean values of foods from nine food groups (20).

f) Data collection methods and Measurement

Data were collected using a questionnaire adopted from Ethiopian Demographic Health Survey, different literatures and FAO food grouping method, which were designed to assess Demographic and Socio –Economic Characteristics, Health and Household Environment related characteristics and Meal pattern and Dietary diversity score related characteristics. Weight was measured to the nearest 0.1kg using calibrated digital weight scales in standing position with light cloths and bare foot. Height was measured to the nearest 0.1cm using height measuring Stadiometer in standing position. Data were collected by six diploma nurses working in the study area.

g) Data Quality Control

Training was given for data collectors on aim of the study, sampling methods and Anthropometric Measurements. Questionnaires were pretested on adolescent school girls found outside the sampled schools. Scales were carefully handled and periodically calibrated by placing standard calibration weights of 2 kg iron bars on the scale to ascertain accuracy.

h) Data analysis

Data were Analysis using SPSS version 20.0. Descriptive statistics was used to describe the study population in relation to relevant variables. Anthropometric measurements were converted to height-for age z-scores and BMI-for-age z-scores using WHO Anthro-plus software. The nutritional status of the study subjects were classified as stunted ($HAZ < =2SD$) and thin ($BAZ < -2 SD$) (9).

Binary logistic regression was used to identify factors associated with stunting and thinness. Then the variables found significantly associated with the study outcomes were included in multiple logistic regressions to identify the independent predictors of thinness and stunting. Finally, P value of less than 0.05 was used to declare significance.

i) Ethical considerations

Letter of Ethical approval was received from Madda Walabu University ethical clearance committee. Official letter of co-operation was also obtained from Goba town education office and from each school directors. Individual assent and parental consent for those participants < 18 years and consent (> 18 years) was secured after a brief explanation about the procedure. The participants were also assured about the Confidentiality data.

III. RESULTS

a) Demographic and Socio-Economic Characteristics

A total of 598 adolescent girls aged 10–19 years were included in the final analysis among 617 which make a response rate 97.2 %. The mean (\pm SD) age of study subjects were 13.5 (\pm 1.9) years.

Three Hundred sixty four (60.9%) of the respondent were orthodox Christians. Majority of the respondent were from Grade four 133 (22.2 %). Majority of the respondents were urban dwellers 573 (95.8%).

Regarding the Educational level of mothers of the respondents, 200 (33.4%) were attended secondary school, 73 (12.2%) were illiterate, 188 (31.4%) can only read and write and only 49 (8.2%) were attended college and university.

Governmental employment and House wife were the predominant occupation of the father and mothers, 204 (44.1) and 347 (58%) respectively (Table 1).

b) Health and Household Environment related characteristics of Adolescent girls

The common sources of drinking water for most adolescent girls were Private Water pipe 506 (84.5%). Almost all of the adolescent girls, 589 (98.5 %) reported that they have home latrine. Nearly half the respondent reported that home gardening was available in their home. Of the respondents 283 (47.3 %) had begins their menstruation (Table 2).

c) Meal pattern and Dietary diversity score related characteristics

Five hundred seventy four (96 %) of the study subjects reported that they were consumed the three regular meal in the preceding day. About 115 (19.2 %) skips their regular meals in the previous week.

Two Hundred seventh one (45.3%) of the respondents practiced adequate dietary diversity (Table 3).

d) Prevalence of thinness and stunting among adolescent girls

The overall prevalence of thinness, low body mass index-for-age Z score less than $\leq -2SD$ among school adolescent girls found were 125 (20.9 %) while the prevalence of stunting, height-for-age Z Scores less than $-2SD$ were 71 (11.9 %) (Table 4).

e) Factors associated with thinness and stunting among school adolescent girls

i. Factors associated with Thinness

Thinness, low body mass index-for-age Z score less than $< -2SD$ was significantly associated with Age of the respondent and educational status of mother.

Early adolescent girls (age ≤ 14) were 1.7 (AOR =1.7, 95% CI: 2.2 – 19.1) times more likely to become thinner as compared to late adolescent girls (age ≥ 14).

Adolescent girls whose mothers had no formal education were 9.6 (AOR=9.6 CI: 2.6 -23.3), mothers who can read and write were 7.6 (AOR =7.6, 95% CI: 2.2 – 19.1) and mothers who had primary education were 5.2 (AOR= 5.2, 95%CI: 1.4 – 17.4) times more likely to be thin as compared to those mothers who are above college and education level (Table 5).

ii. Factors associated with stunting

Stunting, height-for-age Z Scores less than $-2SD$ was significantly associated with dietary diversity practice and Menstruation status of adolescent girls.

Adolescent girls with inadequate dietary diversity were 2.7 (AOR =2.7, 95% CI: 1.5-5.04) times more likely to be stunted as compared their counterpart. Adolescent girls who begin menstruation were 8 (AOR =.20, 95% CI: 0.03 – 0.401) times less likely to be stunted as compared to those who didn't begin their menstruation yet (5).

IV. DISCUSSION

In recent year, Ethiopia has made progress in reducing maternal mortality, while these achievements are encouraging, sustainable results are not expected if the nutritional status of adolescent girls is neglected.

This study found that the prevalence of thinness was 11.9%. This finding is relatively similar with the national nutrition baseline survey report for the NNP of Ethiopia (14%) (8), studies done in Agarfa Ethiopia (13.6) (10) and Hyryana, India 13.7% (11). However this prevalence is higher than the finding of previous study done in Addis Ababa Ethiopia (6.2 %) (12). Moreover, this prevalence is lower than a previous study done in Kenya (15.6 %) (13), Bangladesh (26%) (14) and Tigray region in northern Ethiopia (58.3%) (7). This difference may be due to the differences in socioeconomic, culture, feeding habits, environmental factors, and public service utilization of the community in the study area.

The current study found that prevalence of stunting, height-for-age Z Scores less than $-2SD$ was 20.9%. It was lower than the findings of previous study done in Tigray region, Northern Ethiopia (7). This may be due to time gap and set up differences. In this study majority of the respondents were urban dwellers but in the previous study the respondents were from rural community. Similarly it also lower than the prevalence reported from Bangladesh and Nigeria (32% and 57.8%) (11, 15). The possible reasons for the difference could be due to cultural difference and dietary intake. But the finding of this study is higher than the finding of previous study done in Kenya (12.1%). This may be due to time gap and socio- economical differences.

As can be noted multivariate logistic regression the likelihood of being thin was found to be significant among early adolescent (age ≤ 14) compared to late (age ≥ 14) adolescent girls. The finding of this study is

comparable with the study done in Amhara Regional State, north western part of Ethiopia (17). This could be because of the early growth spurt seen in the girls with sudden increase in height in early age group.

In the present study Educational status of mother was important socio- demographic factor which showed significant association with thinness. Adolescent girls whose mothers had no formal education were 9.6 (AOR 9.6 (95% CI 2.6 -23.3), mothers who can read and write were 7.6 (AOR 7.6 (95% 2.2 – 19.1) and mothers who had primary education were 5.2 (AOR 5.2 (1.4 – 17.4) times more likely to be thin as compared to those mothers who are college and above education level. This finding is supported by previous study conducted in Bangladesh (11). This can be explained as educated mother adopt better caring practices for better allocate family resources for nutrition and have health decision-making power which ultimately affect the nutritional status of the children

This study reveals that Adolescent girls who begun menstruation early were 8 times less likely to be stunted than their counterpart. This finding is in line with the finding of study done in Kenya (13). This may be explained by the fact that delay in bagging of menstruation of respondents may be a sign of malnutrition, as nutritional status of adolescent girls deteriorate, they start menstruation late.

Adolescent girls who practice adequate dietary diversity were 2.7 times more likely to be stunted as compared their counterpart in the past 24 hours. This may be explained by the fact that intake of divers diet increase likelihood of meeting the nutritional requirement of adolescent

The major limitation of this study was, it relay only on anthropometric measurements to determine the nutritional status of adolescent girls. .

V. CONCLUSION

The overall prevalence of thinness and stunting in the study area is high. The risk of thinness and stunting is high among early adolescent girls, adolescent girls with less educated mothers and adolescent girls who had inadequate dietary diversity practice.

School-based nutrition program that focus on diversified diet consumption and promote education of women is highly recommended.

Abbreviations

BMI – Body Mass Index,
CDC – Center for Disease Control,
CM – Centimeter,
DDS –Dietary Diversity Score,
EDHS –Ethiopian Demographic and Health survey,
FAO –Food and Agriculture Organization,
HIV - Human Immunodeficiency Virus,

IDDS –Individual Dietary Diversity Score,
IUGR –Intra Uterine Growth Retardation,
YCN –Infant and Young Child Nutrition,
KG – Kilogram,
LBW –Low Birth Weight,
OR –Odds Ratio,
SPSS-Statistical Package for Social Sciences,
SRS-Simple Random Sampling,
WHO –World Health Organization

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

The authors' responsibilities were as follows. MT conceived and designed the study, performed analysis and interpretation of data and drafted the manuscript. SS Participated in the design of the study and performed the statistical analysis. TA Participated in the design of the study, writing of results and discussion and has been involved in drafting the manuscript. All authors read and approved the final manuscript. AK wrote the paper.

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LISTS OF TABLES

Table 1 : Scio-demographic characteristics of school adolescent girls Goba town, South East Ethiopia, June 2015

	Category	Frequency	percent
Age	10-14	417	69.7
	15-19	181	30.3
Religion	orthodox	364	60.9
	Muslim	167	27.9
	catholic	17	2.8
	Protestant	50	8.4
Place of residence	Urban	573	95.8
	Rural	25	4.2
Type of school	Governmental school	380	63.5
	Private school	218	36.5
Educational status of father	Illiterate	36	6
	Read and write	14	24.9
	Primary school	98	16.6
	Secondary school	170	28.4
	Collage and above	144	24.1
Occupation of father	Governmental employee	204	44.1
	Farmer	126	21.1
	Daily labourer	84	14.0
	Merchant	121	20.2
	Other	3	0.5
Educational status of mother	Illiterate	73	12.2
	Read and write	188	31.4
	Primary school	88	14.7
	Secondary school	200	33.4
	Collage and above	49	8.2
Occupation of mother	House wife	347	58
	Governmental employee	101	16.9
	Daily labourer	39	6.5
	Merchant	111	18.6
Family size	1-3 Family	33	5.5
	4-6 Family	430	71.9
	> =7Family	135	22.6

Table 2 : Health and Household environment related characteristics of school adolescent girls Goba town, South East Ethiopia, June 2015

Variables	Category	Frequency	Percent
Source of drinking water	Private Water pipe	506	84.8
	Public tap water	87	14.6
	Protected well	5	0.8
Availability of latrine facility	Yes	589	98.5
	No	9	1.5
Availability of home gardening	Yes	386	64.5
	No	212	35.5
Use of home gardening	For home consumption	346	57.9
	For sale	5	.8
	For sale and home consumption	37	6.2
What do you grow	fruit	7	1.2
	vegetable	243	40.6
	fruit and vegetable	137	22.9
Menstruation status	yes	283	47.3

	No	316	52.7
Age at first menstruation	10	5	0.8
	11	22	3.7
	12	78	13
	13	71	11.9
	14	67	11.2
	15	39	6.5

Table 3 : Meal pattern and Dietary diversity score related characteristics of school adolescent girls Goba town, South East Ethiopia, June 2015

Variables	Category	Frequency	Percent
The three regular meal during the previous day	Yes	574	96.0
	No	24	4.0
skip any regular meals during the previous week	Yes	115	19.2
	No	483	80.8
Reason for skipping meals	Shortage of food	6	1.0
	Lack of appetite	85	14.2
	sickness	19	3.2
	Others	1	.2
From the children who is served first	female	38	6.4
	male	69	11.5
	together	491	82.1
Dietary diversity score	Adequate	271	45.3
	Inadequate	327	54.7

Table 4 : Prevalence of Thinness among adolescent school girls Goba town, South East Ethiopia, June 2015

	Frequency	Percent
Thinness	71	11.9
No thinness	527	88.1
Total	598	100

Table 5 : Prevalence of stunting among school adolescent girls Goba town, South East Ethiopia, June 2015

	Frequency	Percent
Stunted	125	20.9
Not stunted	473	79.1
Total	598	100

Table 6 : Factors associated with thinness of school adolescent girls Goba town, South East Ethiopia, June 2015

		Thinness		COR 95 % CI	AOR 95 % CI
Factors	Yes	No			
Age	<=14	112	305	0.211 (0.115- 0.386)	1.7 (1.5 – 2.6)
	>=14	13	168		
Educational status of mother	Illiterate	30	43	0.093(0.027 – 3.25)	9.6 (2.6 -23.3)
	Can read and write	62	1`26		
	Primary school	22	66		
	Secondary school	8	195		
	Collage and above	3	46	1	1
Age at first menstruation	11	1	21	10.9 (5.4 -28.15)	3.18 (0.26-18.5)
	12	3	75	12.9 (4.0 -24.1)	2.1 (0.23-17.6)

	13	6	65	5.6 (2.3- 13.3)	2.9(0.3-16.6)
	14	4	63	8.17(2.8 – 23.0)	1.2(0.23-16.72)
	15	3	36	1	1
DDS	Adequate	53	218		
	Inadequate	72	255	0.46 (0.57 – 0.82)	1.75 (0.76 – 1.79)

Table 7 : Factors associated with stunting of school adolescent girls Goba town, South East Ethiopia, June 2015

Factors	Stunting		COR 95 % CI	AOR 95 % CI	
	Yes	No			
Educational status of mother	Can t read and write	24	33	0.56 (0.012 - 0.254)	13 (2.7 - 18.08)
	Can read and write	22	180	0.334(.076-1.46)	2.4 (0.5- 11.01)
	Primary education	10	79	0.322(.068-1.53)	2.2 (0.45 – 11.29)
	Secondary education	13	186	0.58(0.128-2.67)	1.4 (0.30- 6.78)
Menstruation	Above secondary	2	199	1	
	Yes	23	260		
Individual dietary diversity score	No	48	267	0.49 (0.29 – 0.83)	.201 (0.03 – 0.40)
	Adequately diversified	54	17		
	Not adequately diversified	273	254	2.9 (1.6-5.2)	2.7 (1.5-5.04)

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Education and Household Income Determines Under Nutrition among Adults of Mumbai Metropolitan Region

By Sanjay Rode
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Abstract- Malnutrition among adults is a major health issue in urban and rural parts of India. Malnutrition among adults reduces the economic productivity and such individual fall under poverty trap. This study finds the high severe malnutrition among male in Kalwa, Koparkhairne, Mankhurd and Rabale. The incidence of moderate malnutrition among male is found among male in Koparkhairane, Govandi and Chembur. Among female, it is found in Koparkhairne, Mulund, Kalwa and Mankhurd. At lower age, we found high incidence of malnutrition among adults. At lower education, adults have high incidence of malnutrition. As educational level of adults increases, the incidence of malnutrition declines fast. Similarly, at lower income, incidence of malnutrition is higher among adults. As income increases, the incidence of malnutrition among adults declines fast. A lower age at marriage, we found higher incidence of malnutrition among male and female. All adults consume milk, curd, pulses, vegetables, fruits and non-vegetarian food in diet but the incidence of malnutrition is higher. Few adults read magazines, watch cinema and television in slums of Mumbai Metropolitan Region.

Keywords: health, water supply, sanitation.

GJMR-L Classification: NLMC Code: QU 145



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Education and Household Income Determines Under Nutrition among Adults of Mumbai Metropolitan Region

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Abstract- Malnutrition among adults is a major health issue in urban and rural parts of India. Malnutrition among adults reduces the economic productivity and such individual fall under poverty trap. This study finds the high severe malnutrition among male in Kalwa, Koparkhairne, Mankhurd and Rabale. The incidence of moderate malnutrition among male is found among male in Koparkhairane, Govandi and Chembur. Among female, it is found in Koparkhairne, Mulund, Kalwa and Mankhurd. At lower age, we found high incidence of malnutrition among adults. At lower education, adults have high incidence of malnutrition. As educational level of adults increases, the incidence of malnutrition declines fast. Similarly, at lower income, incidence of malnutrition is higher among adults. As income increases, the incidence of malnutrition among adults declines fast. A lower age at marriage, we found higher incidence of malnutrition among male and female. All adults consume milk, curd, pulses, vegetables, fruits and non-vegetarian food in diet but the incidence of malnutrition is higher. Few adults read magazines, watch cinema and television in slums of Mumbai Metropolitan Region. The physical, electronic and mobility related asset holding is very low among houses of malnourished adults. The logit regression model shows that adult malnutrition is positively co-related with sex, trip of women for drinking water, purification of drinking water, private electricity, bike, television, boy's preference and beans eaten in diet. Malnutrition among adults is negatively co-related with age, income, education, cooker, red magazine and curd in diet. There are alternative policies are required to reduce malnutrition among adults in Mumbai metropolitan Region. Government must provide training for self-employment to poor people. Banks must provide credit to poor people. They can start small business and increase the standard of living in region. Health care staff must visit to slums. They must treat adults with various illnesses. The women required special health care and treatment. The nurses, doctors and midwife must survey slums of region and counsel about pre-and post natal care, contraceptives and nutrition. State government must provide food under public distribution system at concessional rate. Such policies will certainly reduce the malnutrition among adults at certain extent. For economic growth of region, quality human resource is a basic requirement. Such policies will solve the malnutrition problem among adults and improve the quality of human resource for region.

Keywords: health, water supply, sanitation.

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I. INTRODUCTION

Under nutrition problem is widely viewed in all developing countries. The incidence of underweight and overweight are observed among adults in India. Mumbai Metropolitan Region is a financially and culturally well-developed region of India. Mumbai is emerging as global financial hub because it handles one third of the country's foreign trade. It is contributing maximum in terms of tax revenue to central government.

The growth of services sector such as finance, IT, telecom, tourism, entertainment, advertising, communication is higher. Mumbai city is a head quarter of important financial institutions such as RBI, BSE, NSE, SEBI and the corporate companies and multinational companies. Due to various business and employment opportunities, most of the unskilled and skilled people attract to region from all over India. Mumbai Metropolitan Region is migrants friendly because it provides cheap labor to the informal sector. The educated and skilled migrants do not find any employment and housing related issue in region. They easily integrate in region with locals and other migrants. The unskilled migrants are fit into menial or minor jobs in region. Such jobs are bottom line of economic pyramid of region. All Municipal Corporations provide basic civic amenities such as sanitation, water supply, health care, transport, electricity. Such civic infrastructure facilities are expected to improve the standard of living of population and promote economic growth of region. The growth of population in region has its implication on housing, solid waste, transportation, health care. The standard of living of population is continuously declining in region. It was expected that the economic growth of region will have more investment in civic amenities. The poor in the city would have provided housing, water supply, electricity and sanitation facilities. But due to inadequate and unaffordable housing, the slums are proliferated fast in the region and more people are living in various slums. The growing urbanization has led to the continuous increase in inequalities in region (Arokiasamy P. et.al. 2013). The slums are located at hill slopes under high tension power transmission lines, coastal side locations, low lying area including the

marshy zones, foot paths and near railway tracks. Slums are an integral part of region but government always notifying them as illegal structures. Therefore slums are avoided from providing all necessary infrastructure facilities. They are regularly demolished in region.

The urban poor in Mumbai Metropolitan Region of the slums place greater reliance on wage labour for their livelihood, daily purchase of food and non-food items. But the majority of urban slum dwellers do not have steady, well-paying or secure jobs. Due to low, uncertain and fluctuating income, women are supplementing income by involving themselves in income generating activities. They are also working longer hours with heavy manual labour. Public health care facilities in the urban area are heavily demanded, which results in longer waiting periods. The amount they pay for medicine and transport, besides losing their salary for the day proves expensive, thereby reducing the demand for healthcare through the substitution effect. Such households may rely more on self-medication, buying across the counter medication, traditional home remedies or simple inaction. The cost associated with the utilization of public health services includes direct and indirect monetary costs. The direct cost is low but the indirect (monetary and non-monetary) costs such as forgone income, the possibility of losing the job and costs associated with not performing normal activities, that is, paid and unpaid work, tending to children and transportation costs, are much higher for such mothers. The mother's opportunity cost of time seems to play more of a role than user fees although both waiting time and travel time are less elastic. The requirement of mothers to remain present at the work place often prevents them from using the public health facilities. Mothers cannot frequently visit such health facility because the characteristic of urban informal labour market is that the workers can easily be replaced, consequently the job can be lost through even an occasional absence. In addition, mothers involved in the causal labour market do not have time to prepare daily necessary meals, which are required for the family.

Urban slum dwellers do not have access to safe, regular and convenient supply of good quality water at an affordable cost. The people of *katcha* slums have to wait in a long queue, simply because water is available only for a few hours of a day. If the distance to the water tap from the house is considerable, then it is also an onerous and time-consuming task. Typically women and children are assigned to carry water, signifying a high level of drudgery and physical hardship. In order to make repeated trips, women suffer a high opportunity cost in terms of childcare, income generating activities and household chores. It is imperative to remain present on time at the work place; women either transfer their responsibility of carrying water to older sibling, or they wake up early in the

morning to collect water. Urban *kutch*a slum households are paying an extravagant price for water supply. The water in the *katcha* slums is unsafe for drinking. Reliable drinking water can be brought in but at a substantial cost. The amount drinking water, which a family uses, depends on average earning of family, the distance of the water and tap price of water and how it has to be carried. The low-income families are spending comparatively larger proportion of their incomes on water, that too just few liters of water every day. Irregularity of water supply forces the urban poor to store water in iron, plastic drums or large earthenware pots. Every day is a struggle to obtain just few liters of water for the whole family. Inadequate water is a major cause of water borne and water washed diseases. The water borne diseases occur by drinking contaminated water. Water washed diseases occur when there is a lack of water and sanitation in household hygiene. The *kutch*a slums do not have access to sanitation services. Those slums that do have public latrines, they are far away, overused and poorly serviced and rarely well maintained. Similarly, most of the latrines are badly constructed and therefore in dilapidated condition. Absence of universal sanitation and limited access to water supply is another cause of infections and diseases. The prevalence of common infectious diseases is undoubtedly much greater in poor of slums (Lunn Peter G. 2002). In Mumbai Metropolitan Region, the health status of children is in jeopardy due to rapid urbanisation, which has led to the creation of informal shack settlements on the outskirts of cities. Factors such as poverty, overcrowding and the possible contamination of food can have an impact on the health status of children (Theron, M. et.al 2006). The problem of urban slums is generally evaluated from the point of view of the non-slum urban population, which sees slums as a problem to be solved rather than as an integral and necessary part of the urban environment. In order to make Mumbai Metropolitan Region a modern world-class region, the government has urged the policy of slum eradication. Most of the squatters do not have residential proof such as ration cards, voting cards, adhar card etc. The government of Maharashtra and the Municipal Corporations have been consistently involved in giving notification for slum demolition. Therefore slum eviction is a constant threat to urban *katcha* slums. The massive demolition of *kutch*a slums by bulldozing them is a regular phenomenon in Mumbai Metropolitan Region. The poor of the urban *kutch*a slums have questionable access to basic facilities like water, electricity, health, sanitation, market, school and transportation, etc. This is because of the slum's unauthorized status, the municipal authorities have not provided any basic facilities. Depending on their purchasing capacity, the residents of the unauthorized areas buy these essential services from slumlords or

local leaders. People of *katcha* slums are also inclined to improve basic facilities and their houses. Thus given lower levels of income, any improvement program like water supply or sewage facility could lead to increase in the property value of such slums. Simultaneously they refrain from improvements since their slums can be destroyed at any time. The Municipal authorities have stopped all basic facilities to slum dwellers and their houses have been demolished. Such activity could make the poor people of any *katcha* slum to live in perpetual fear and tension.

II. DATA AND METHODOLOGY

For this study, we have surveyed 3004 households from *kutch* slums in Mumbai Metropolitan Region. Total eighteen slum settlements were chosen for this study, from which five slum settlements are belonging to the central suburbs while the rest came from the eastern suburbs. Within each slum settlement and house, a questionnaire was administered. This study is conducted during January to February 2016. We analysed primary data in SPSS @20 and STATA @10 software. We used logit model to examine the socio-economic and demographic co-relation with child malnutrition in region.

a) Measurement of adult malnutrition

Among adults, the malnutrition is measured with the help of anthropometric measures. The body mass index is the best measure of adult malnutrition. It is defined as follows.

$$BMI = \frac{W}{H^2 (m)}$$

Among adults, Body Mass Index (BMI) is calculated by dividing weight in kilograms by the square of height in meters. BMI is used to define underweight or overweight. The WHO expert committee has suggested the classifications: mild underweight (BMI 17-18.49), moderate underweight (BMI 16- 16.99) and severe underweight (BMI <16). These three group are considered as Chronic Energy Deficient (CED). For overweight, the categories are as follows: Grade 1 (BMI 25.00-29.99), Grade 2 (BMI 30.00-34.99), Grade 3 (BMI 35-39.99) and Grade 4 (BMI > 40.00). Each of these adult malnutrition measures are related to morbidity and mortality (Gillespie S. and Lawrence H. 2003). We have used all the above categories to classify adults as malnourished and normal.

b) Econometric model for malnutrition among adults

The adult's nutritional status in region is defined in terms econometric model as follows.

$$ANs = AP_{(MMR)}$$

It means nutritional status of adults is related to nutritional status of population in Mumbai Metropolitan Region.

$$ANs = f(S, E, D)$$

Adult nutritional status is depending upon the socio-economic status in slums.

Alternatively,

$$ANs = f(A, E, Y, Am, Nk, Fv, A)$$

Nutritional status of adults is depending upon age, education, income, age at marriage, nutritional knowledge, food eaten and assets in house.

$$Es = (I, P, S, HS, G, PG)$$

Educational status of adults is classified as illiterate, primary, secondary, high school, graduate and post graduate studied.

$$Vf = (M, P, C, P, F)$$

Vegetarian food eaten by adults consists of milk, pulses, vegetables and fruits

$$NVf = (E, C, M, F)$$

The non-vegetarian food eaten by adults mainly consists of eggs, chicken, meat and fish.

$$Nk = (RM, N, WT, Wc)$$

Nutritional knowledge is received by adults from reading magazines, reading newspaper, watching television and watching cinema.

$$Pa = (B, W, C, Sm)$$

A physical asset consists of bed, watch, cooker and sewing machine in house of adults in region.

$$Ea = (R, F, T, Fr, Te)$$

An electronic asset consists of radio, fan, television, fridge and telephone in house.

$$Ma = (Bi, C, B)$$

Mobility related assets consist of bike, car and bicycle.

c) Adult malnutrition in Mumbai Metropolitan Region

The nutrition status of adults is classified based on anthropometric measure. The Body Mass Index (BMI) is best estimator of classifying the nutritional status of adults. Such measure is used for adults of slums in Mumbai Metropolitan Region (MMR). The results are presented in the following table.

Table 1 : Area wise incidence of adult under nutrition (Per cent)

BMI/ Suburb	Below 15		15-16		16-18.5		18.5-25	
	M	F	M	F	M	F	M	F
Mankhurd	24.37	15.37	7.06	7.33	13.44	15.37	38.04	34.52
Govandi	18.59	15.16	9.75	3.85	18.37	15.84	36.96	35.75
Kalwa	33.22	18.85	6.85	6.67	19.52	13.56	26.71	35.17
Koparkhairne	28.72	19.74	10.64	9.21	17.02	14.47	31.91	34.87
Rabale	20.75	15.94	3.77	5.80	18.87	11.59	41.51	40.58
Turbe	15.13	11.62	8.55	2.02	14.47	11.62	35.53	44.95
Vashi	5.77	13.04	7.69	2.17	11.54	13.04	59.62	52.17
Ghatkopar	5.22	4.14	1.26	2.28	11.69	8.49	52.34	42.03
Reay road	9.68	14.29	6.45	3.57	12.90	17.86	54.84	53.57
Kurla	6.68	7.10	3.85	2.62	12.55	11.59	54.45	40.75
Chunabhatti	18.59	8.76	7.54	3.09	16.58	12.89	46.23	39.18
Byculla	6.67	7.81	2.50	5.47	16.67	11.72	50.83	39.06
Thane	5.90	7.58	2.12	2.48	7.87	7.58	41.00	35.95
Airoli	4.49	1.89	4.49	5.66	6.74	12.26	47.19	50.00
Juinagar	11.11	14.86	4.94	4.05	22.22	8.11	38.27	40.54
Chembur	6.76	10.11	9.46	5.62	18.92	17.98	44.59	34.83
Mulund	11.11	11.23	4.09	5.88	8.19	10.16	36.84	30.48
Bhandup	6.96	7.53	2.45	1.91	9.02	6.57	47.04	36.20
Total	12.36	10.34	4.69	3.83	12.75	10.94	43.56	37.80

Source: Primary data

A mal-nourished individual could be either affected currently with respect to some existing challenge, or could imply a reduced potential for dealing with some future situation such as an increased demand for work, for resisting an infection, for a psychosocial response etc. That is to say malnutrition can result in either a sub optimal response to a current stress or to an increased risk of failure at some future time (Payne, Philip and Peter Cutler 1984). Incidence of severe malnutrition among male is 33.22 per cent in Kalwa. The high incidence of severe malnutrition among female is 19.74 per cent in Koparkhairane. The lowest incidence of severe malnutrition among male (4.49 per cent) and female is found (1.89 percent) in Airoli. The moderate high incidence among male is 10.64 percent and among female it is 9.21 percent in Koparkhairane. The lowest moderate malnutrition incidence among male is found in Ghatkopar (1.26 per cent) and among female it is 1.91 percent in Bhandup. The high mild incidence of malnutrition is found among male (22.22 percent) in Juinagar. Among female, it is 17.98 percent in Chembur. The lowest mild incidence of malnutrition among male is found in Airoli (6.74 percent). Among female, it is 6.57 percent. Nutrition embodies a central role in human well-being. It is both an essential element of, and also a

critical input to other aspects of, well-being. Adequate nutritional attainment is essential equally for men and women. However, women's nutrition assumes additional importance due to its critical but complex association with their well-being and the implication it has for human development. Yet, it is women's nutrition - to that extent their well-being - which has often been subsumed under the umbrella of "family welfare" Under-nutrition would denote a deprivation of the basic aspect of well-being: the lack of freedom to lead a minimally healthy life. The implications that women's malnutrition have for human development are multiple and cumulative (Jose, Sunny and K. Navaneetham 2008). We observed that it is the custom that husbands are given priority in intra-household food distribution regardless of the amount of food available in the household. During seasons of acute food shortage within the household, women may stay without food as they give priority to their husband and children. Even during times of food surplus in the household, women usually eat their meals after their husband. In most cases, this may not be due to nutritional ignorance but often relates to tradition and to power relations within the household. Women with less influence or power within the household will be less likely to procure fair food distribution within the

household (Regassa, Nigatu and Barbara J. Stoecker 2012). We can easily find the intra-household food distribution through BMI.

Table 2 : The incidence of obesity among adults (Per cent)

BMI/Suburb	25-30		30-35		35-40		40<	
	M	F	M	F	M	F	M	F
Mankhurd	10.93	13.00	3.19	8.27	1.14	3.31	1.82	2.84
Govandi	11.34	16.29	3.17	7.24	0.23	2.26	1.59	3.62
Kalwa	7.53	13.33	2.05	7.13	2.05	1.84	2.05	3.45
Koparkhairne	5.32	11.84	5.32	3.95	0.00	0.00	1.06	5.92
Rabale	13.21	20.29	1.89	1.45	0.00	1.45	0.00	2.90
Turbe	17.11	16.67	5.92	8.08	0.66	3.03	2.63	2.02
Vashi	7.69	10.87	5.77	6.52	1.92	0.00	0.00	2.17
Ghatkopar	15.47	21.53	8.09	12.63	2.88	4.35	3.06	4.55
Reay road	12.90	3.57	0.00	3.57	0.00	3.57	3.23	0.00
Kurla	12.55	17.20	3.85	11.21	3.04	5.23	3.04	4.30
Chunabhatti	7.54	16.49	1.01	12.89	2.51	4.64	0.00	2.06
Byculla	15.83	15.63	3.33	16.41	2.50	3.13	1.67	0.78
Thane	21.79	24.31	8.02	7.97	4.08	5.62	9.23	8.50
Airoli	19.10	16.04	10.11	8.49	4.49	3.77	3.37	1.89
Juinagar	14.81	13.51	2.47	10.81	1.23	5.41	4.94	2.70
Chembur	9.46	14.61	8.11	6.74	1.35	3.37	1.35	6.74
Mulund	18.71	19.79	7.02	10.16	2.92	6.42	11.11	5.88
Bhandup	17.27	24.49	7.47	9.44	2.71	3.70	7.09	10.16
Total	14.53	18.72	5.49	9.13	2.35	3.83	4.27	5.39

Source: Primary data

Incidence of obese-1 is high among male (19.10 per cent) in Airoli. Among female, it is 24.49 per cent in Bhandup. The lowest obese –I incidence of malnutrition is found among male in Kalwa (7.53 per cent). Among female, it is 3.57 per cent in Reay Road. The highest obese-II incidence among male is 11.10 percent in Airoli. It is highest among female in Byculla (16.41 percent). The obese-II malnutrition among male is not found in Reay Road. It is lowest among female as 1.45 per cent. The highest incidence of obese-III among male is found as 4.49 percent in Airoli. It is 6.42 per cent among female in Mulund. The obese –III incidence among male is not found in Rabale and Koparkhairane. It is also not found among female in Koparkhairane and Vashi. The Obese-IV incidence of malnutrition is found among male in Mulund as 11.11 per cent. Among female, it is 10.16 per cent. The incidence of Obese-IV is not found among male in Rabale and Vashi. Among female, it is nil in Reay road.

d) Age wise incidence of malnutrition among adults

There is relationship between adult age and malnutrition. The education, assets effects on the health status of adults.



Table 3 : Age wise classification of adult malnutrition (Per cent)

BMI /Age wise(years)	Sex	<15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<
15-25	F	4.29	2.71	12.63	43.75	20.27	9.34	2.90	4.10
	M	7.36	4.56	16.29	44.04	13.31	6.80	2.14	5.49
25-35	F	1.44	1.71	6.56	44.20	24.71	12.76	4.94	3.68
	M	2.05	1.36	7.99	60.33	20.47	6.14	1.07	0.58
35-45	F	0.54	1.62	4.14	50.00	22.48	11.33	5.40	4.50
	M	0.78	1.18	9.02	62.55	16.27	5.69	3.53	0.98
45-55	F	1.02	1.02	4.57	29.95	29.95	17.77	8.63	7.11
	M	1.04	0.35	10.07	60.07	19.44	4.51	2.08	2.43
55-65	F	0.00	4.55	10.61	13.64	42.42	18.18	1.52	9.09
	M	1.65	1.65	8.26	52.07	23.97	9.92	2.48	0.00
65<	F	6.45	3.23	3.23	38.71	9.68	32.26	3.23	3.23
	M	0.00	5.00	15.00	50.00	20.00	10.00	0.00	0.00
Total	F	2.57	2.17	8.82	43.50	22.86	11.56	4.23	4.29
	M	3.59	2.40	11.35	54.52	17.28	6.32	2.01	2.53

Source: Primary data

The incidence of severe malnutrition among below 15 age group male is 7.36 per cent. Among female, the incidence of severe malnutrition is 6.45 per cent in above 65 age group. The incidence of moderate malnutrition among male above 65 years is 5 per cent. Among 55-65 age group female, the incidence of severe malnutrition is 4.55 per cent. The incidence of mild malnutrition among male in 15-25 age group is 16.29 per cent. Among 15-25 age group, the mild malnourished female are 12.63 per cent. In 15-25 age group, nearly 44.04 per cent male have normal BMI. Above 65 age group, 38.71 per cent female have normal BMI. Nearly 23.97 per cent male of 55-65 age group are obese-1. The 29.95 per cent female of 45-55 age group are obese-1. The obese-2 male, have 10 per cent of incidence in above 65 age group. The female in this age group have 32 per cent incidence of obese 2. Incidence of obese-3 among male is 3.53 per cent in 35-40age group. Among female in this category, it is 8.63 per cent of 45-55 age group. The obese-4 among male in 15 -25 age group is 5.49 per cent. Among female, the obese-IV incidence is 4.10 per cent in 15-25 age group. Adult malnutrition leads to assets depletion, loss of current income and pauperising medical ex-penditure. In such households participation in the labour force tends to be unstable, daily incomes fluctuate highly, often being exceeded by food expenditure and pitching the household into chronic debt. Survival tactics included fasting and foregoing meals, the splitting of the household, shedding of the old, etc. Patterns of household anthropometry showed evidence of both inadequate food entitlements at the household level and high disease incidence. Third, severe malnutrition in the non-poor was acute rather than chronic and revealed diverse nutritional aetiologies, often associated with maternal illness and with bottle feeding or delayed weaning (Barbara Harriss et.al 1990).

e) Educational attainment and malnutrition incidence

Education helps male and female to understand the nutritional content of food which he/she is eating. Education helps to understand the nutritional content of food she/he eating. Education also helps to understand the self-health status. Educated person can immediately approach to health care facility. He/she can easily interact with doctors, community members, relatives and household members. Less education is a problem and it ultimately leads to malnutrition. A less educated woman does not understand physical growth of the child. The education helps to use assets, household resources, community resources in an efficient manner. Education helps to improve health status of mother and children. A highly educated person can work few hours and earn enough income for family.

Table 4 : Educational status and malnutrition incidence (Per cent)

BMI/Education	Sex	>15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<	Total
Illiterate	M	42.11	40.26	54.62	59.29	57.48	56.5	51.68	42.28	56.17
	F	34.09	35.21	50.00	56.60	53.48	39.89	51.61	30.00	51.99
Primary	M	10.53	10.39	9.25	7.42	8.41	8.22	9.40	9.40	8.23
	F	6.82	14.08	9.47	7.36	9.42	10.64	20.97	5.00	8.51
secondary	M	42.11	46.75	33.82	29.75	31.77	32.63	37.58	45.64	32.65
	F	53.03	42.25	37.63	32.10	32.96	37.23	25.81	51.25	34.74
Higher secondary	M	5.26	1.30	2.31	2.87	2.10	1.86	1.34	2.68	2.49
	F	4.55	4.23	2.37	2.98	2.26	9.04	1.61	12.50	3.46
Graduate	M	0.00	1.30	0.00	0.60	0.25	0.53	0.00	0.00	0.40
	F	0.76	4.23	0.53	0.91	1.69	3.19	0.00	1.25	1.20
Post graduate	M	0.00	0.00	0.00	0.07	0.00	0.27	0.00	0.00	0.06
	F	0.76	0.00	0.00	0.06	0.19	0.00	0.00	0.00	0.10

Source: Primary data

We found 42.11 per cent male and 34.09 per cent female are illiterate but they suffered from severe malnutrition. The 59.29 per cent male and 56.60 per cent female are in normal BMI but they are illiterate. Nearly 42.28 per cent male and 30 per cent female are illiterate but they are obese IV category malnourished. Total 10.53 per cent male and 6.82 per cent female are primary studied but they are severely malnourished. There are only 7.42 per cent male and 7.36 per cent female are in normal BMI category but they are primary studied. We also found 9.4 per cent male and 5 per cent female are primary studied but they are in Obese-IV category.

The 42.11 per cent male and 53.03 per cent female are primary studied but they are in obese IV category. The 42.11 per cent male and 53.03 per cent female are secondary studied but they are severely malnourished. The 29.75 per cent male and 32.10 per cent female are secondary studied but they have normal BMI. Nearly 45.64 per cent male and 51.25 per cent female are secondary studied but they are suffered from obese-IV malnutrition category. The 5.26 per cent male and 4.55 per cent female have studied higher secondary but they are severely malnourished. There are 2.87 per cent male and 2.98 per cent female are in normal BMI but they are higher secondary school studied. The 2.68 per cent male and 12.50 per cent female are higher secondary studied but they are suffered from the obese-IV category. The 0.60 per cent male and 0.91 per cent female are in normal BMI category and they are graduates. We have not found graduate male and female with obese IV malnutrition category. We have not found mild and moderate malnutrition incidence among male and female with post-graduation education. It is clear that, the incidence of the severe, moderate and mild under-nutrition and obese I to IV clearly related with less education. As educational achievements among male and female increase the malnutrition incidence

automatically declines. We found very less incidence of malnutrition with post- graduation among adults.

f) Household income and malnutrition incidence among adults

Household income is a sole determinant of nutritional status of adults. High income is an important aspect for good nutritional status of adults. A high income person always visit a doctor explain the health problem, buy reliable medicine. He/she buys fresh vegetables fruits and gain nutrition via knowledge. She/he can keep children in good health status through buying number of health inputs. But the irregular and low income does not help households to invest in health. Health care is not received due to high direct and indirect cost to family. Therefore income is the determinant of health status of household members.



Table 5 : Malnutrition incidence and household monthly income (Per cent)

BMI/Income (Rs.)	Sex	>15	15-16	16-18.5	18.5-25	25-30	30-35	35-40	40<	total
0	F	0.00	0.00	0.00	0.07	0.25	0.53	0.00	0.67	0.17
	M	0.00	0.00	0.00	0.06	0.00	0.53	0.00	0.00	0.06
1-5000	F	27.37	26.92	24.86	22.41	20.52	24.67	24.16	18.79	22.61
	M	18.94	27.78	28.68	21.42	16.20	17.02	24.19	10.00	20.95
5000-10000	F	42.11	55.13	60.98	63.75	66.38	61.80	61.07	65.10	63.04
	M	64.39	52.78	58.42	63.30	67.42	63.83	53.23	85.00	63.60
10001-15000	F	13.68	11.54	9.54	10.97	10.26	11.14	13.42	12.08	10.92
	M	10.61	15.28	10.00	11.81	11.49	14.36	19.35	5.00	11.69
15001-20000	F	12.63	3.85	2.89	2.34	1.73	1.06	0.67	2.68	2.37
	M	5.30	2.78	1.84	2.56	3.77	1.60	3.23	0.00	2.69
20001-25000	F	4.21	2.56	1.45	0.27	0.74	0.80	0.00	0.67	0.71
	M	0.76	0.00	0.79	0.67	1.13	2.13	0.00	0.00	0.81
25001-30000	F	0.00	0.00	0.29	0.13	0.00	0.00	0.00	0.00	0.09
	M	0.00	1.39	0.26	0.12	0.00	0.53	0.00	0.00	0.16
>30000	F	0.00	0.00	0.00	0.07	0.12	0.00	0.67	0.00	0.09
	M	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.03

Source: Primary data

Income and malnutrition incidence has correlation. Higher income families do not have incidence of malnutrition. They easily fulfil their basic requirement from income. The 27.37 percent female and 18.94 percent male have family monthly income between Rs. 0-5000 but they are severely malnourished. The 22.41 percent female and 21.42 percent male have Rs. 0-5000 income and they are in normal BMI category. The 18.79 percent female and 10 percent male have Rs.0-5000 monthly income but they suffered from obese –IV category. The 42.11 percent female and 64.39 percent male have Rs.5000-10000 monthly income but they are severely malnourished. The 63.75 percent female and 63.30 percent male have monthly income of Rs.5000-10000 and they have normal BMI. Nearly 61.80 percent female and 63.83 percent male have Rs.5000-10000 monthly income but they are obese-II. Total 65.10 percent female and 85 percent male have monthly income of Rs.5000-10000 monthly but the male and female are obese-IV. The 13.68 percent female and 10.61 percent male have Rs.10000-15000 monthly income but they suffered from severe malnutrition. The 10.97 percent female and 11.81 percent male have normal BMI. There are 13.42 percent female and 19.35 percent male have Rs.10000-15000 monthly income but they suffered from obese III malnutrition. The 12.63 percent female and 5.30 percent male have income of Rs. 15000-20000 but they are severely malnourished. The 2.34 percent female and 2.56 percent male have normal BMI but their monthly income is between Rs.15000-20000. We have not found the obese III malnutrition

incidence with monthly income of Rs.20000-25000. Similarly, we have not found the severe malnutrition, obese-I, III and IV incidence with monthly income of Rs.25000-30000. The incidence of malnutrition among adults is not found with above Rs.30000 monthly income. It is clear that higher income wipe out the incidence of malnutrition among adults. Higher income is most important for families to reduce the incidence of malnutrition among adults in Mumbai Metropolitan Region.

g) Age at marriage and malnutrition incidence

Marriage is a significant event in any individuals' life. The age at marriage for female is significant factor because it is not only affecting on her own health but health of child in future. In the long term, the child's health status is depending upon the health status of mother. Therefore higher age at marriage helps to take care of self as well as child health. The physical growth and development of women gets affected due to child bearing. Therefore the growth process of mothers is affecting on the children's growth. Therefore higher age at marriage is an advantage for next generation.

Table 6 : Age of marriage and incidence of malnutrition among male and female (Per cent)

BMI/ Age of marriage (Years)	>12		13-18		18-23		23-28		28.1-33		33<	
	F	M	F	M	F	M	F	M	F	M	F	M
>15	5.26	2.27	71.58	64.39	22.11	31.82	0.00	1.52	1.05	0.00	0.00	0.00
15-16	1.28	2.78	74.36	63.89	20.51	31.94	3.85	1.39	0.00	0.00	0.00	0.00
16-18.5	2.02	3.16	67.63	59.47	27.46	33.95	2.60	2.63	0.29	0.53	0.00	0.26
18.5-25	2.21	1.76	67.38	62.65	26.20	31.51	3.68	3.83	0.47	0.24	0.07	0.00
25-30	1.85	2.45	67.37	69.49	28.06	25.05	2.22	2.45	0.37	0.56	0.12	0.00
30-35	2.39	1.06	67.37	69.15	27.06	27.13	2.92	1.60	0.27	1.06	0.00	0.00
35-40	2.01	1.61	75.17	74.19	21.48	24.19	1.34	0.00	0.00	0.00	0.00	0.00
40<	3.36	1.25	77.18	80.00	18.12	17.50	1.34	1.25	0.00	0.00	0.00	0.00
Total	2.23	2.04	68.42	64.62	26.06	29.94	2.86	3.01	0.37	0.36	0.06	0.03

Source: Primary data

Nearly 71.58 percent female and 64.39 per cent male are married in 13-18 years of age group but they are severely malnourished. We have not found obesity incidence if they are married above 33 years of age. The 74.36 per cent female and 63.89 percent male have married in 13-18 age group but they suffered from mild malnutrition. We have not found any incidence of obesity if they have married after 28 years. We found that 67.38 percent female and 62.65 per cent male are in normal BMI category but they have got married in 13-18 age groups. The 26.20 percent female and 31.51 per cent male are married in 18-23 age group and they have normal BMI. It is lowest incidence of malnutrition among adults as compare to other categories. Now also most of the marriages are taking place before 18 years. The parents and youths do not measure their weight and height at the time of marriage. Therefore it is difficult to measure nutritional status at the time of marriage. There

are 67.37 per cent female and 69.49 per cent male married in 13-18 age group but they fall under the obese -I category. Around three fourth of male and female got married in 13-18 age group but they fall under obesity III. We have not found the obesity III category male and female in 28 and above age at marriage. Similarly we have found 77.18 per cent female and 80 per cent male got married in 13-18 age group but they suffered from obesity IV category. We have not found obesity IV malnutrition incidence if they got married above age of 28 years.

h) Malnutrition and food eaten by adult members

Knowledge of nutrition helps adults to consume right food and get nutrition's for body. There are vitamins and proteins required for body. For women, nutritional knowledge helps to own health as well as child health.

Table 7 : Nutritional knowledge and food eaten among adults (Per cent)

BMI	Know nutrition		Milk		Curd		Pulses	
	F	M	F	M	F	M	F	M
>15	12.11	18.33	63.16	73.48	47.37	58.33	86.32	87.88
15-16	13.85	15.56	73.08	62.50	58.97	48.61	91.03	81.94
16-18.5	12.89	15.26	65.03	59.74	48.55	42.63	89.88	88.16
18.5-25	23.81	22.49	69.32	62.80	56.89	47.42	90.64	90.76
25-30	12.72	12.26	66.87	66.48	55.75	57.44	94.07	95.48
30-35	12.92	12.66	61.01	69.68	50.13	56.38	92.31	89.89
35-40	13.36	13.23	67.11	63.93	58.39	59.02	93.29	96.72
40<	12.68	11.25	65.10	75.00	52.35	66.25	97.32	92.50
Total	13.26	13.11	67.08	64.26	54.73	50.31	91.83	91.03

Source: Primary data

Nearly 23.81 per cent female and 22.49 per cent male have knowledge of nutrition and they are in normal BMI. Milk mainly contains vitamin A and consumption of milk helps to improve the nutritional status. It improves the work capacity of adults. Most of the families consume milk in diet or drink milk. There are female (63.16 percent) and male (73.48 percent) eat milk in diet but they are severely malnourished. The female (73.08 percent) and male (62.50 percent) eat milk but they are moderately malnourished. The 65.10 percent female and 75 percent male are eating milk but they are obese-IV. We found 69.32 percent male and 62.80 percent female eat milk and they have normal BMI. Curd consumption is good because it contains calories and vitamin A. It is good for the eye sight and body. Adult members prepare curd at home or they buy from shops. The regular consumption of curd reduces the incidence of malnutrition among adults. Nearly 47.37 per cent male and 58.33 percent female eat curd in diet but they are severely malnourished. The 58.97 percent female and 46.61 percent male are eating curd in diet but they are moderately malnourished. The 56.89 percent female and 47.42 percent male eating curd but they have normal BMI. There are 52.35 percent female

and 66.25 percent male are eating curd and they are in obese- IV category. Pulses are the rich source of vitamins and nutrition. The regular consumption of pulses reduces the chance of malnutrition. But it is depending on the income of the family. Most of the families have lower income and they cannot afford to buy pulses. There are 86.32 percent female and 87.38 percent male are severely malnourished but they are eating pulses in diet. There are 91.03 percent female and 81.94 percent male are eating pulses but they are moderately malnourished. Nearly 90.64 percent female and 90.76 percent male are eating pulses and they are in normal BMI category. The 97.32 percent female and 92.50 percent male are eating the pulses but they are in obese IV category.

j) Consumption of fruits and vegetables and malnutrition incidence

The vegetables and fruits contain good source of different nutrition. Fresh vegetables are always preferred in diet. They improve the nutritional status of adults. We asked consumption of fruits and vegetables in the diets.

Table 8 : Vegetable consumption, fruits eaten and malnutrition incidence (Per cent)

BMI	Vegetables		Beans		Fruits	
	F	M	F	M	F	M
>15	100	100	43.16	56.06	54.74	65.91
15-16	97.44	98.61	58.97	43.06	66.67	58.33
16-18.5	99.13	98.95	49.42	41.58	56.65	47.89
18.5-25	99.20	99.03	54.55	45.59	61.34	51.06
25-30	98.39	99.44	53.89	58.38	58.79	61.02
30-35	98.14	97.87	50.13	57.45	53.58	60.64
35-40	99.33	100.00	57.05	57.38	63.09	59.02
40<	100.00	98.75	52.35	65.00	53.69	70.00
Total	98.91	99.06	53.22	49.14	59.14	54.42

Source: Primary data

Beans are the good source of vitamins and protein. Beans is green vegetable and helps to get good health status. The 43.16 percent female and 56.06 percent male are eating beans but they are severely malnourished. The 58.97 percent female and 43.06 percent male are eating beans but they are moderately malnourished. The 54.55 percent female and 45.59 percent male are eating beans and they have normal BMI. The 52.35 percent female and 65 percent male are eating beans but they are in obese-IV category. Different vegetables contain different kinds of vitamins and protein. The household members must eat the fresh vegetables because they contain valuable source of energy and vitamins. But again the lower income does not support to buy the fresh vegetables and they are

expensive source of energy. They do not buy fresh vegetable which is again affects on their body. All male and female are eating vegetables but they are severely malnourished. All the male and female eat vegetables and they have normal BMI. It is true with all the categories. All male and female said that they eat all vegetables but still they suffer from under nutrition and over nutrition.

Fresh fruits are rich source of vitamins. Such vitamins are necessary requirement of human body. But fresh fruits are expensive. The family size is big and the monthly income is low. Therefore it is difficult to buy the fresh fruits to all members. It effects on the nutritional status of adults. The 54.74 per cent female and 65.91 per cent male are eating fruits but they suffer from

severe malnutrition. The 66.67 per cent female and 58.33 per cent male eat fruits but they are suffering from the moderate malnutrition. The 56.65 per cent female and 47.89 per cent male are eating fruits in diet but they suffer from the mild malnutrition. Nearly 61.34 per cent

female and 51.06 per cent male eat fruits in diet and they are in normal BMI category. The 63.09 per cent female and 59.02 per cent male are eating fruits but they are in obese-III category.

j) *The malnutrition among adults and consumption of non-vegetarian food*

Table 9 : Consumption on non-vegetarian food and malnutrition incidence (Per cent)

BMI/Non-veg	Eggs		Chicken		Meat		Fish	
	F	M	F	M	F	M	F	M
>15	54.74	70.45	55.79	71.76	55.79	68.94	56.84	70.45
15-16	65.38	61.11	66.67	61.11	66.67	55.56	69.23	59.72
16-18.5	59.25	52.89	59.54	54.47	59.25	49.21	59.30	53.42
18.5-25	64.30	55.56	64.41	55.68	61.90	53.98	63.97	56.06
25-30	61.06	64.60	60.94	63.65	59.21	62.15	60.72	63.28
30-35	57.03	62.23	56.50	64.89	55.17	61.70	56.53	64.36
35-40	63.76	57.38	63.76	57.38	62.42	59.02	63.09	59.02
40<	55.03	71.25	56.38	71.25	55.03	67.50	56.38	68.75
Total	61.62	58.40	61.72	58.71	59.96	56.39	61.52	58.57

Source: Primary data

Eggs are the good source of protein to adults. Protein is directly related to work capacity and productivity. But lower consumption of eggs does not help to get more protein and improve work capacity. Eggs are expensive and it is not feasible to buy every day eggs for all family members. The 54.74 per cent female and 70.45 per cent male are eating the eggs but they are severely malnourished. The 65.38 per cent female and 61.11 per cent male are eating eggs but they are moderately malnourished. The 64.30 per cent female and 55.56 per cent male eat eggs and they are in normal BMI category. The 63.76 per cent female and 57.38 per cent male are eating eggs but they are in obese- III category. Most of the non-vegetarian household members eat chicken. It is source of protein and vitamins. It improves the health and work productivity. But chicken is expensive source of protein. The 55.79 per cent female and 71.76 per cent male are eating chicken but they are severely malnourished. The 66.67 per cent female and 61.11 per cent male are eating chicken but they are eating eggs. The 64.41 per cent female and 55.68 per cent male are eating chicken and they have normal BMI. The 60.94 per cent female and 63.65 per cent male are eating chicken but they are obese-I malnourished. The 56.38 per cent female and 71.25 per cent male are eating chicken but they are obese IV category. Some families also eat meat once in a week. It is good source of nutrition. But occasionally households eat meat. The 55.79 per cent female and 68.94 per cent male are eating meat but they are severely malnourished. The 66.67 per cent female and 55.56 per cent male are eating meat but they are moderately malnourished. The 61.90 per cent female and 53.98 per cent male are eating meat and they have normal BMI. The 59.21 per cent female and 62.15 per

cent male are eating meat but they are obese I. The 55.17 per cent female and 61.70 per cent male eat meat but they are obese-II category. Fish is a source of calories, vitamins and protein. Most of the poor families eat fish but they eat once in a week. Good and fresh fish improves stock of protein in body. Therefore it helps to improve nutritional status of adults. The 56.84 per cent female and 70.45 per cent male are eating fish but they are severely malnourished. The 63.97 per cent female and 56.06 per cent male are eating fish and they have normal BMI. The 56.38 per cent female and 68.75 per cent male are eating fish and they are obese IV category. The non-vegetarian food is consumed because of taste and nutrients requirement (Solomons, Noel W. 2007).

k) *Malnutrition incidence and knowledge gain by adults*

Exposure to media and newspapers, magazines is important for adults. It certainly improves nutritional knowledge and reduces the malnutrition among adults. But access to media is very low among the adults in slums.

Table 10 : Exposure to mass media and incidence of malnutrition among adults (Per cent)

BMI/Mass media	Read magazine		Watch cinema		Watch Television	
	F	M	F	M	F	M
>15	1.05	6.82	7.37	21.21	47.37	54.55
15-16	3.85	2.78	8.97	15.28	56.41	52.78
16-18.5	4.34	3.95	8.67	11.84	54.91	55.29
18.5-25	6.28	7.34	12.96	7.17	69.33	71.13
25-30	2.84	2.26	6.80	4.90	68.48	62.71
30-35	3.71	2.66	6.63	4.79	61.54	68.09
35-40	5.37	1.61	6.04	0.00	67.11	69.35
40<	2.68	1.25	3.36	1.25	61.74	61.25
Total	3.77	3.24	7.77	7.70	60.48	68.19

Source: Primary data

The different magazines give knowledge of different subjects. For health of mother and child, few magazines are important. But it depends on adults which magazines they prefer and read. But reading magazines are the good source of information. Reading magazine helps to improve the knowledge. Most of the time magazines are good source of nutritional knowledge. The choice of magazine is done by adult members. But the poor families do not have money to buy magazines. They do not have knowledge to buy magazine and read relevant topic of health. Only 11.05 per cent male and 16.82 per cent female are reading magazine but they are severely malnourished. The 4.28 per cent female and 3.34 per cent male are reading magazine and they have normal BMI. The 2.68 per cent female and 1.25 per cent male read magazine but they are suffered from obese IV category. There are 4.28 per cent female and 3.34 per cent male read magazine and they are in normal BMI category. The 2.68 per cent female and 1.25 per cent male read magazine but they are obese IV. Watching television regularly helps to get maximum knowledge. It is related to health care, child growth, nutrition etc. Most of the poor people do not know the various programs on television. Firstly do not

have electricity connection. Their income is low therefore they cannot buy television. They do not have time to watch programs. The 47.37 per cent female and 54.55 per cent male are watching television but they are severely malnourished. The 59.33 per cent female and 61.13 per cent male are watching television and they have normal BMI. Watching cinema in cinema hall is a luxury for the poor families. But most of the poor families are involved in daily wage earning. They cannot afford to buy tickets and watch cinema in the theatre. They do not have time also. The 7.37 per cent female and 21.21 per cent male are severely malnourished. The 8.96 per cent female and 7.17 per cent male are watching cinema but they have normal BMI. The 3.36 per cent female and 1.25 per cent male are obese- IV category and they are watching cinema.

l) Malnutrition incidence and household assets

Household assets are important for the family members. As income increases, the household assets also increase. But households in the slums are poor. Therefore they do not have different required assets in their house. It effects adversely on their socio-economic status.

Table 11 : Bed and electricity in house and malnutrition incidence (Per cent)

BMI/Assets	Bed		Electricity		Watch		Cooker	
	F	M	F	M	F	M	F	M
>15	8.42	15.91	84.21	85.61	7.37	17.42	40.00	52.27
15-16	5.13	6.94	87.18	84.72	8.97	6.94	46.15	38.89
16-18.5	12.14	10.26	85.55	84.21	11.27	11.05	43.64	35.00
18.5-25	24.52	24.47	85.63	88.63	24.78	21.67	56.19	53.89
25-30	20.40	21.85	90.61	89.45	15.82	16.01	45.98	47.65
30-35	15.65	28.72	87.80	81.91	10.61	21.81	41.11	43.62

35-40	12.75	19.35	83.22	80.65	12.75	24.19	46.31	32.26
40<	8.72	21.25	75.17	65.00	7.38	27.50	28.19	36.25
Total	15.07	16.25	86.45	86.83	13.49	13.75	44.41	43.24

Source: Primary data

Due to poverty, poor households cannot buy the cooker. It helps in food preparation and save fuel. The 40 per cent female and 52.27 per cent male have cooker in house but they are severely malnourished. The 46.19 per cent female and 43.89 per cent male have cooker in house but they are in normal BMI. The 28.19 per cent female and 36.25 per cent male have cooker in house but they are in obese IV category. Bed at home helps to relax household members. But they do not have proper space to keep bed. The houses are illegal in slums. Therefore purchase of bed is not possible. The 8.42 per cent female and 15.91 per cent male are

severely malnourished. The 7.37 per cent female and 17.42 per cent male have watch but they are severely malnourished. The 7.38 per cent female and 27.50 per cent male have watch in house but they are in obese IV category. Most of the houses do not have electricity connection. They buy electricity from private sources. The private electricity connections are given by the local leader and charge units at higher rate. Due to lack of meters, the poor are paying high price for the electricity. The 84.21 per cent female and 85.61 per cent male have electricity in house but they are severely malnourished.

Table 12 : Electronic items and malnutrition incidence (Per cent)

BMI/Assets	Radio		Sewing machine		Fan	
	F	M	F	M	F	M
>15	0.00	0.76	0.00	0.00	84.21	86.36
15-16	0.00	0.00	0.00	0.00	88.46	84.72
16-18.5	0.58	0.26	0.58	0.53	86.42	83.68
18.5-25	1.00	2.79	1.60	0.18	85.89	89.42
25-30	0.74	1.13	0.12	0.00	90.73	89.27
30-35	0.80	2.66	0.27	0.53	88.33	83.42
35-40	0.67	1.61	0.00	0.00	85.23	83.87
40<	0.00	2.50	0.00	0.00	78.52	65.00
Total	0.77	0.94	0.37	0.19	86.99	87.34

Source: Primary data

Ownership of radio is useful to listening songs and programs of different nature. But the poor families do not have the money to buy radio. Secondly they cannot spend more time in listening songs and programs. We found that one per cent female and 2.79 per cent male have radio and they are in normal BMI category. We have not found the ownership of radio with house of moderate malnutrition among adults. There are 85.89 per cent female and 89.42 per cent male are having normal BMI and they have fan in house. The 78.52 per cent female and 65 per cent male are in obese IV category. Poor families can earn income by stitching cloths and stich cloths of others. It reduces the family expenditure on the stitching. We have not found swing machine with mild and moderate malnourished male and female. The obese III and IV category male and female also not found the swing machine in house. Fan is a basic requirement of family. But lack of electricity and money does not support households to buy the fan in house. The (84.21 per cent) female and male (86.36 per cent) having fan in house but they are

severely malnourished. The (85.89 per cent) female and (89.42 per cent) male are having normal BMI and they have fan in house. The 78.52 per cent female and 65 per cent male have fan but they are in obese- IV category. There are 17.89 per cent female and 26.51 per cent male are having television in house but they are severely malnourished. The 12.08 per cent female and 4.84 per cent male have television in house but they are suffered from Obese-III category. Television in house is important to see the current news, health related programs and talk shows. But most of the households are poor. They cannot afford to buy the television. Electricity connection is not regular. Households are kuttcha. Therefore television is not purchased by poor households. The sewing machine is not found with obese-III and IV category malnourished male and female.

Table 13 : Television and fridge and incidence of malnutrition among adults (Per cent)

BMI/Assets	Television		Refrigerator		Telephone	
	F	M	F	M	F	M
>15	17.89	26.51	0.00	0.00	4.21	5.30
15-16	23.08	25.00	2.56	0.00	16.67	11.39
16-18.5	23.70	17.37	1.16	0.53	12.72	13.84
18.5-25	27.18	28.10	4.87	4.16	18.02	16.20
25-30	12.86	12.81	0.87	0.94	7.54	5.65
30-35	15.12	7.45	0.53	0.53	4.77	4.79
35-40	12.08	4.84	2.01	1.61	2.68	3.23
40<	13.42	5.00	0.00	1.25	6.04	2.50
Total	16.38	13.17	0.89	0.94	7.80	5.79

Source: Primary data

Fridge helps to preserve perishable items and food for some time. The milk, vegetables, curd, ice-creams are preserved for some time. Such items are consumed every day in diet. Regular consumption of food in diet helps to improve the nutritional status of family members. But poverty, education, nature of house may effects on the purchase of refrigerator. We have not found the refrigerator with severely malnourished male and female. There are only 0.87 per cent female and 1.16 per cent male are in normal BMI and they have refrigerator in house. The 0.53 per cent female and 0.53 per cent male have refrigerator and they are in obese-II category. Most of the poor do not have telephone connection in house. Telecom authority does not provide the telecom connection to poor households of slums. Their houses are not authorised. Similarly they cannot afford to pay telephone bills. Therefore ownership of television effects on the health status of poor. Telephone in house is useful to call in emergency. Mothers can get appointment of doctors.

Health related guidance can be received from doctor and nurse. Therefore telephone in house is important for health and relations. But we found that the 4.21 per cent female and 5.30 per cent male have telephone of house and they are suffered from severe malnutrition. The 16.67 per cent female and 1.39 per cent female have telephone in house but they are moderately malnourished. The 8.02 per cent female and 6.20 per cent male have telephone in house but they have normal BMI. The 4.77 per cent female and 4.97 per cent male have telephone connection but they are in obese-II category.

m) *The mobility related assets and malnutrition among adults*

The mobility related assets are important to get number of things from community and health care facilities. The time of family members can be saved with the help of mobility assets.

Table 14 : Mobility related assets and malnutrition incidence (Per cent)

BMI/Assets	Bike		Car		Bicycle	
	F	M	F	M	F	M
>15	0.00	4.55	0.00	0.00	1.05	6.82
15-16	3.85	2.78	0.00	0.00	2.56	4.17
16-18.5	0.87	1.32	0.29	0.00	2.02	2.11
18.5-25	01.87	2.67	1.20	0.06	3.61	7.58
25-30	0.37	0.00	0.00	0.00	1.24	0.75
30-35	0.27	0.53	0.00	0.00	1.86	0.53
35-40	0.00	0.00	0.67	0.00	2.68	0.00
40<	0.67	0.00	0.00	0.00	0.00	0.00
Total	0.69	0.81	0.14	0.03	1.57	1.65

Source: Primary data

The bicycle, bike and car helps to ride in city, go to market, buy fresh vegetables from market, take appointment of doctors etc. The poor have irregular

income therefore they cannot afford to pay for bike. The 3.85 per cent female and 2.78 per cent male have bike but they are moderately malnourished. We have not

found the male and female as obese III and bike at home. Car is very expensive for poor households. They do not have space to park vehicles. The car is very useful for traveling but it is not owned by many households in slums. Only 0.20 per cent female and 0.06 per cent male have car and they have normal BMI. It is useful to ride within suburb and slums. It helps to go to market, carry vegetables, milk and others. But poor households do not have money to buy bicycles. The 2.56 per cent female and 4.17 per cent male are moderately malnourished but they have bicycles at home. Only 1.61 per cent female and 1.58 per cent male have bicycle and they are in normal BMI category. We have not found the male and female in obese-IV category malnutrition and bicycle at home.

n) *Logit regression model*

The nutritional status of a child is not a continuous variable, children are either malnourished or are not malnourished. The categories are discrete; consequently we decided to use a logit model. This is also because we are testing only for the categories as

malnourished versus not malnourished. The logit model is given as follows (Greene 2003)

$$\text{Prob (a given child is malnourished)} = \frac{\exp (b'x)}{(1+\exp (b'x))}$$

Where:

X is the vector of explanatory variables; b is the vector of associated coefficients. The regression model is used for stunting, wasting and underweight separately.

o) *Regression results of malnutrition among adults*

We have categorised adults malnutrition based on their weight for height. The BMI indicator is used for adult malnutrition. The malnourished adults are regressed on socio-economic and demographic factors.

$$Y_i = \beta + \beta_1 S + \beta_2 A + \beta_3 I + \beta_4 E + \beta_5 TW + \beta_6 PW + \beta_7 PE + \beta_8 C + \beta_9 BI + \beta_{10} TEL + \beta_{11} BO + \beta_{12} RW + \beta_{13} C + \beta_{14} BE + \alpha$$

The results are presented in the following table.

Table 15 : Regression results of malnutrition among adults

Variables	Co-efficient	Standard error	Z test	Significant
Sex	0.16*	0.053	3.11	0.002
Age	-0.02*	0.002	-6.63	0.000
Income	-0.13*	0.005	-26.33	0.000
Education	-0.01**	0.006	-2.36	0.018
Trip of women	0.02***	0.013	1.86	0.062
Purification of water	0.47***	0.290	1.64	0.100
Private electricity	0.18**	0.083	2.17	0.030
Cooker	-0.18**	0.072	-2.53	0.011
Bike	0.58**	0.265	2.20	0.028
Television	0.20**	0.084	2.47	0.013
Boys preference	0.22**	0.093	2.38	0.017
Read magazine	-0.29***	0.150	-1.96	0.050
Curd	-0.24**	0.123	-2.03	0.043
Beans	0.34**	0.122	2.83	0.005
constant	-3.12*	0.17	-18.07	0.00
	LR chi ² = 1123.17	Prob> chi ² = 0.00	Log likelihood = -4177.28	Pseudo R2 = 0.118

* Significant at 1 %, ** Significant at 5 %. *** Significant at 10 %

The female are more malnourished as compare to male. It is because women are denied the access of food and health care in poor households. They get the lower quantity of food share. They are denied the health care facility when they required. Therefore they are more malnourished as compare to male. Male enjoy the dominant share of food, income, health care in house. Therefore sex of the adult is positively co-related and

statistically significant with malnutrition. The incidence of malnutrition is higher at lower age. The youth's body is in growing stage. It required additional nutrition. But poverty does not help to eat good food and nutrition. At older age, body does not require much vitamins and protein. This is because growth gets completed and body does not required extra nutrition. Therefore age of adult is negatively co-related with malnutrition. The

households in the slums are poor and they have irregular source of income. The irregular work and frequent payments are affecting on the spending of households. Lower income does not help households to buy the necessary inputs required for health. Ultimately it effects on the nutritional status of adults. Therefore the income of household is negatively co-related with BMI and it is statistically significant. Educational achievements are negatively co-related with malnutrition. Highly educated person can understand health status and can find quick solution for health problem. But less educated person does not understand actual health problem. He/She can talk with doctor, nurse and buy medicines. Therefore it is statistically significant and negatively co-related with BMI. The water is not available in most of the poor houses in slums. The stand posts are located far away. The women have no choice but to carry drinking water from long distance. The women wake up early and start carrying water. It is statistically significant and positively co-related with adult malnutrition. The households in the slums do not have fixed source of water. They carry water from different sources. They do not have water purification system at home. They drink water which they brought from different sources. The untreated water effects on the nutritional status of adults. They fall sick because of water washed and water borne diseases. Therefore the purify water is negatively co-related and statistically significant with BMI. Most of the households in the slums do not have proper electricity connection. For the kutcha house, the state electricity board does not provide electricity connection. Most of the poor households took connection from private and illegal sources. They pay much higher electricity charge for the private connection. Therefore it is statistically significant and positively co-related. Most of the poor households do not have separate kitchen. It is because households have kucha and small house. There is no separate room as kitchen. Therefore it is positively co-related and statistically significant with BMI. Most of the households are poor. They do not have proper kitchen wear. The cooker is very useful to prepare food in short period. But the poverty does not help them to buy cooker. Therefore it is negatively co-related and statistically significant. The ownership of bike is negatively co-related and statistically significant with BMI. The bike is very useful to go to market bring vegetables, milk from market, go to workplace and visit relatives. But the households are poor and they cannot buy bike. They cannot park bike near house because there is no space to park the bike. Most of the houses have television in house. Television is house helps to watch different programs. But having television at home does not help adults to reduce the incidence of malnutrition. Therefore having a television at home, there is positive co-relation with malnutrition. Such relationship is statistically significant and positively co-related. The malnutrition incidence among adults is

negatively co-related with reading magazine and it is statistically significant. The poor do not have money to buy magazines. Reading magazines also required time, the poor people of slums do not have time. Therefore it is ultimately effects on their nutritional status. Health related magazines certainly help to improve nutritional status. But not reading magazines are statistically significant and positively co-related with malnutrition among adults. Most of the adults do not eat curd. Curd is a good source of calories and vitamin A. But the households are poor and they cannot afford to bring milk and prepare curd. Buying curd from market is very expensive. Therefore eating curd is negatively co-related and statistically significant. Most of the poor households eat beans. It is a good source of vitamin. But we have not observed how frequently households buy the beans and eat it. But the relationship of beans is positive and statistically significant with adult malnutrition

p) Policy implication

There is need of long and short term comprehensive policies to tackle malnutrition among adults of slums in Mumbai Metropolitan Region. The public investments in health services, water and sanitation infrastructure, and education are required on urgent basis in region. The poor households cannot afford a balanced, micro-nutrient rich diet, better education, shelter, and health care (Svedberg, Peter 2006). Health care staff must visit to slums in region. An iron folic acid tablets, injections and counselling must be provided to pregnant women. They must be encouraged for institutional deliveries and newly mothers must provide exclusive breastfeeding to children. Health care staff must provide health care on priority basis to children who have fever, cough and diarrhoea. Health care staff must monitor growth of the children of various slums in region. They must provide suggestions on modern contraceptives such as condoms, pills, IUD to couples. The modern contraceptive method, contraceptive method related counselling, suggestions on problems of contraceptive method must be provided to couple of slums at free of cost. Such steps will reduce the sterilisation rate among women and it will provide spacing among children. It will also help to reduce fertility among couples and improve the quality of children in slums of region. In short, an existing public and private health care systems need to be strengthened to provide effective health care for adults and children (Aguayo, Victor M. et.al 2012).

Government can start number of programs for the poor people of slums. The specific skills, training and self-employment to women and children can improve their income. Government should encourage commercial banks to provide loans to poor people at lower interest rate. It will help them to start their own small scale business. Government must ensure and force private sector to provide maternity leave to

pregnant women those are working in informal sector. Government must establish day care centres at different slums. The malnourished children must be feed properly in day care centres. The day care centres must be connected to anganwadi's and health care centres in region. The comprehensive coverage of anganwadi and health care facilities are required on urgent basis. Government must establish infrastructure facilities in slums of metropolitan region. The water supply, sanitation, electricity, roads, transportation must be provided in slums. Government must prepare short stories and episodes of maternal and child health related programs and they must be broadcast on television and radio. Most of the women and household members will listen such programs while working. Such efforts will help to reduce the incidence of malnutrition among adults. Government must provide rice, wheat, sugar, oil through public distribution system to poor people of various slums. It will help to improve calorie intakes and nutritional status of people. For slums, NGO's, researchers, social workers and politicians must suggest various policies related education, health care, income, skills, employment, water and power supply, roads and transport. Such steps will help to reduce malnutrition incidence among adults and children.

Government is required to work for poor adolescent girls of different slums in suburbs. They must be provided scholarship for education. The age at marriage of adolescent girls must be increased through enhancing education and government must make strict law related to underage or illegal marriages. The educated girls must be given preference in government jobs. If the economic status of such girls is improving then child malnutrition incidence will decline automatically. Government must regulate and legalise houses of the poor people in region. Demolition of houses is not the solution to eradicate poverty and malnutrition among adults.

There should be political commitment to improve nutritional status of adults of slums in region. Local leaders must come forward to implement various policies for poor people. There is need of active involvement of households, leaders, social workers in various programs for poor people of slums. For economic development of any region and country, qualitative human resource is required. Therefore every child and adult must be seen as window of opportunity for future human resource of region. All the policies will certainly reduce the incidence of malnutrition among adults in region at some extent.

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Comparing Consumption of Green Leafy Vegetables to Cruciferous Vegetables in Relations to Incidence of 17 Different Cancers: A Meta-Analysis

By Richard Lee Pollock

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Introduction- Cancer is a group of over 100 different types of malignancies and there are several potential substances in green leafy vegetables (GLV) and cruciferous vegetables (CV) that may exhibit anticancer effects [1]. 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. Table 1 shows 11 of these GLV and some of the 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 [2].

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Comparing Consumption of Green Leafy Vegetables to Cruciferous Vegetables in Relations to Incidence of 17 Different Cancers: A Meta-Analysis

Richard Lee Pollock

I. IMPLICATIONS AND CONTRIBUTIONS STATEMENT

This study will contribute to people's knowledge of the importance of frequent daily intake of green leafy vegetables and cruciferous vegetables. Limited knowledge about the importance of these vegetables intake appears to be a serious worldwide health problem. The significant findings of this study will help provide some remedial measures to solve this problem of increased risk of cancers.

II. INTRODUCTION

Cancer is a group of over 100 different types of malignancies and there are several potential substances in green leafy vegetables (GLV) and cruciferous vegetables (CV) that may exhibit anticancer effects [1]. GLV are leafy 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. Table 1 shows 11 of these GLV and some of the 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 [2].

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 be potent chemopreventives possessing the ability to prevent and inhibit tumorigenesis [3].

There is a need to research the worldwide scholarly journals to investigate case-control studies dealing with GLV and CV intake and the incidence of human cancers. After reading many previously published articles on this topic, there are apparent contradictions in research findings on whether GLV and CV intake does significantly lower incidence of cancer. The problem is that people worldwide are risking their health by not consuming enough GLV and CV on a daily basis. What could happen if we do not solve the problem? The World Health Organization (WHO) write on their website that cancer is a leading cause of death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) in 2008 [4].

This meta-analysis research approach attempted to fill this knowledge gap by combining data from multiple studies to a common effect size (odds ratio) and statistically examine 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 these apparent contradictions in prior research findings. The specific aims of this study were to attempt to answer the following: (1) assess the relationship between GLV intake and incidence of cancer; (2) assess the relationship between CV intake and incidence of cancer; and (3) determine which has a better genuine protective effect against cancer incidence, GLV or CV intake?

III. MATERIALS AND METHODS

a) *Experimental design*

Searching for relevant studies was primarily performed by computer search engines seeking databases which included information about the subject. PubMed Central, Academic Search Complete, Medline, Proquest Central, Science Direct, Google, and Yahoo online were the most online periodical databases used. The criteria for including studies in this meta-analysis included: (1) a time period for collecting source studies which was from 1980 until 2015; (2) include only full text scholarly journal studies; (3) only studies showing no severe methodological flaws were included;

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(4) the collection of primary studies had to be case-control study design; (5) only include relations between similar independent variables (GLV and/or CV intake levels) and dependent variables (incidence of any cancer studied); (6) all studies had to measure GLV and/or CV consumption which was estimated by highest versus lowest quantiles (quintiles, or quartiles, or tertiles); (7) studies that reported an effect size of: odds ratio (OR), and their respective 95% confidence intervals (CI) data; and (8) source studies collected in this meta-analysis had to use logistic regression models to control for confounding or interaction variables and the results were expressed as adjusted OR if needed. IRB at Trident University International ethically approved the content of this meta-analysis (no human subjects used).

All meta-analysis calculations were performed by the software package Comprehensive Meta-Analysis Version 2 by Biostat (CMA v.2). These calculations include determining 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) which shows all the combined studies, their p-value, common OR, 95% CI for each study, relative weights for each study, and either a fixed effect model or random effect model. Borenstein, Hedges, and Higgins et al. [5] write that the selection of a model must be based solely 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. These same authors are experts on meta-analysis research, so only the random effect model was chosen for this meta-analysis.

The relative weights for each study were calculated by 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 [6]. An OR of 1.00 represents no treatment effect. Whereas when the OR falls below 1.00, this indicated participants that consumed GLV or CV in the highest quartile were less likely to develop incidence of cancer. If the effect size falls above 1.00, this indicated study subjects were more likely to develop incidence of cancer due to GLV or CV intake in the highest intake quantiles. The 95% CI bounding 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 [6]. 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 [6]. The conventional

value of significance level for this meta-analysis was pre-set to an alpha of 0.05 [7].

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, postmenopausal, premenopausal, colon, rectum, ever tobacco, never tobacco, colorectal, stomach, dark GLV, and light GLV. In this study, it emerged that the OR were comparable for each subgroup, so it was decided to use the study as the unit of analysis. This required calculating a "combined" effect size (utilizing the CMA v.2 software) for subgroups within each study, and imputes the values for the full group which recorded one treatment effect 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 OR versus its precision ($1/\text{standard error}$). Duval and Tweedie's trim and fill method was also calculated by CMA v.2 software for detecting the presence of publication bias and assessing its impact on this meta-analysis study. Duval and Tweedie's trim and fill builds on the key idea behind the precision funnel plot; that in the absence of publication bias the plot would be symmetric about the summary effect. If there are more small studies on the right than on the left of the mean effect size, the concern is that studies may be missing from the left. Duval and Tweedie's method imputes these missing studies, adds them to the analysis, and then re-computes the summary effect size.

IV. THEORY

This study recognized the many theories of how GLV intake reduces incidence of disease. The intervening variable facilitates a better understanding of the relationship between GLV intake and reduction of disease. Some of these hypothesized intervening variables found in GLV are folic acid, the antioxidants beta-carotene and vitamin E, soluble fiber, calcium, and vitamin K. It has been theorized in numerous studies that these essential nutrients and phytochemicals found in GLV, if consumed in adequate amounts, reduces the incidences of some human diseases. The researchers in these studies theorize on the mechanisms of disease reduction caused by GLV intake. In the 2010 decade, researchers are conducting extensive research studies to discover phytochemicals connections to disease prevention, but so far, solid evidence is mostly lacking [19]. There are thousands of these phytochemicals in GLV and researchers are just beginning to understand and theorize how a handful of these phytochemicals work, and what is current in the 2010 decade may change tomorrow [19].

V. DATA ANALYSIS AND RESULTS

Over a two year search period (2012-2015) thousands of scientific papers were reviewed for this meta-analysis. Table 2 shows the total number of collected case-control studies (N=45) that were relevant and reviewed in this meta-analysis. Twenty-nine case-control studies were combined in meta-analysis which included the relations between CV intake and incidence of cancer and used OR as the effect size. Thirty-four case-control studies were combined which included the relations between GLV intake and incidence cancer and used OR as the effect size. A total of 17 cancers were examined in the 45 case-control studies which included thyroid, renal cell carcinoma, non-Hodgkin lymphoma, lung, breast, gastric, endometrial, colorectal, ovarian, pancreatic, prostate, hypopharyngeal, nasopharyngeal, cervical, cutaneous melanoma, esophageal, and urothelial cancer.

a) Research Question 1

Does an increased intake of CV significantly reduce incidence of cancer?

Twenty-nine studies shown had a similar common effect size (OR) and a meta-analysis was used to combine results from the 29 different studies. Figure 1 shows a Forest plot of the 29 studies and meta-analysis. The random effect model was selected for combining the source studies. The model indicates an overall OR effect size of the 'almost every day' highest vs. lowest quantile intake category of CV on cancer as: $OR = 0.753$ (95% CI .695 to .816), $p < .001$.

b) Detecting the Presence of Publication Bias-----CV

All the collected studies were evaluated for the likelihood of publication bias using a funnel plot of the log odds ratio versus its precision (1/standard error) and Duval and Tweedie's trim and fill method. Note in Figure 2 that the large case-control cancer studies appear toward the top of the funnel plot graph, and tend to cluster near the mean of the log OR in the relationship between 29 cancer case-control 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 OR. Figure 2 shows a possible presence of publication bias in the 29 studies with the studies distributed asymmetrically about the mean effect size. By contrast, in the absence of publication bias, the bottom of the funnel plot would tend to show an even concentration of studies around the mean [5]. Duval and Tweedie's method imputes nine missing studies to the right and adjusts new $OR = 0.822$, 95% $CI = 0.753$ to 0.894 from the observed values (0.753, 95% $CI = 0.695$ to 0.816).

c) Research Question 2

Does an increased intake of GLV significantly reduce incidence of cancer?

Thirty-four case-control studies shown had a similar common effect size (OR) and a meta-analysis was used to combine results from the 34 different studies. Figure 3 shows a Forest plot of the case-control studies and meta-analysis. The random effect model was selected for combining the source studies. The model indicates an overall OR effect size of the 'almost every day' highest vs. lowest quantile intake category of GLV on cancer as: $OR = 0.659$ (95% CI .590 to .736), $p < .001$.

d) Detecting the Presence of Publication Bias-----GLV

Figure 4 shows a possible presence of publication bias in the 34 case-control studies with the studies distributed asymmetrically about the mean effect size. Duval and Tweedie's method imputes nine missing studies to the right and adjusts new $OR = 0.739$, 95% $CI = 0.659$ to 0.828 from the observed values (0.659, 95% $CI = 0.590$ to 0.736).

e) Research Question 3

Which has a better genuine protective effect against cancer incidence, GLV or CV intake?

It was determined from final meta-analysis results, GLV's OR was 0.659 which is a 34.1% reduced incidence of the researched cancers. CV's meta-analysis results indicated an OR of 0.753 which is a 24.7% reduced incidence of the researched cancers. Results indicate that GLV have a 9.4% better genuine protective effect against cancer incidence than CV in the highest quantile intake as compared to the lowest intake.

VI. DISCUSSION OF FINDINGS

A noteworthy finding of this meta-analysis study is the protective effect associated with high consumption of GLV and CV. These vegetables are a characteristic and traditional dietary habit of worldwide populations as shown in this study. It has been previously postulated that this could explain the very low cancer incidence rates observed in populations that consume these vegetables. This meta-analysis study has been able to provide some clues for further investigation into the role of diet of GLV and CV prevalent in regions where causation of many forms of cancer occurs.

The intent of this study was to investigate potential influences of GLV and CV intake on incidences cancers on worldwide human populations. An extensive search for relevant studies was initiated to learn more about these diet-cancer relationships. Forty-five studies were collected and used in two separate meta-analysis to investigate the effects GLV and CV intake have on incidences of 17 different cancers. A composite of the research questions in this meta-analysis study was; does an increased intake of GLV and CV significantly reduce the worldwide incidence of 17 aggregated

cancers studied? Results shows both meta-analysis indicated a statistical significant reduction in incidence of cancer with an adequate intake of GLV including CV. Even after adjusting effect sizes for possible publication bias via Duval and Tweedie's method, both meta-analysis results indicated GLV and CV consumption significantly reduced cancer incidences.

Forty five case-control studies were collected that investigated the relationship between the incidences of researched cancers with the consumption of GLV and CV which used OR as their effect size. These studies included 77,563 case participants and controls, with 28,543 case participants having 17 different type cancers. The first research question of this meta-analysis study was; does an increased intake of CV significantly reduce the incidence of these 17 cancers? The random effect model indicated an overall OR effect size of the 'almost every day' highest vs. lowest quantile intake category of CV on cancer as: $OR = 0.753$ (95% CI .695 to .816), $p < .001$, showing 24.7% lower odds that an intake of CV significantly reduces the incidence of these 17 cancers in the highest intake category as compared to the lowest. GLV showed even a better genuine protective effect against cancer incidence: $OR = 0.659$ (95% CI .590 to .736), $p < .001$, showing a significant 34.1% lower odds.

a) *Phytochemicals and Minerals Fight Cancer*

Why does the intake of GLV appear to reduce the incidences of forms of cancer? The phytochemicals in GLV and CV appear to provide much of the disease fighting power. GLV and CV provide adequate amounts of soluble fibers, retinol, carotenoids, vitamin C, riboflavin, folic acid and mineral salts like calcium, iron, and phosphorus [8]. Antioxidants, such as retinol, carotenoids, and vitamin C have been found to exert protective effects against cancer [9]. Individuals with high intakes of soluble fiber appear to be at significantly lower risk for developing coronary heart disease, stroke, hypertension, diabetes, obesity, and certain gastrointestinal cancers [10]. Antioxidants, especially flavonoids and vitamin C found in GLV, are a class of compounds thought to prevent certain types of chemical damage caused by an excess of free radicals. Flavonoids and vitamin C inhibits or quenches free radicals and reactive oxygen species in the body which helps fight cancer, heart disease, stroke and other immune compromising diseases [11]. These and other experts believe that over time free radicals contribute to the development of disease and if antioxidants can help neutralize harmful compounds, antioxidants found in GLV can reduce cell damage and prevent some forms of cancer. 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 [12]. Carotenoids have antioxidant potential in the scavenging of harmful free radicals [13] and they

appear to play an important role in the prevention of hepatitis virus-related liver carcinogenesis [9]. Rajalakshmi, and Agalyaa [1] 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 [[14], [15]]. The risk of lymphoma cancer could be affected by reactive oxygen species, which might alter immune responses by damaging DNA and phospholipid membrane structures in lymphocyte cells, but especially the antioxidant properties of beta carotene and vitamin E found in GLV can hinder membrane damage [16]. The antioxidant beta carotene and vitamin A content of GLV and CV are 100-fold greater than in fruits and these two antioxidants have been said to possess the greatest protective effects against lung cancer [17]. These antioxidants may have the capability to prevent oxidative degradation of DNA, they also could act as an immunoenhancer, boosting the body's immune system by helping identify and destroy anomalous cells recognized as foreign such as cancer cells in the lungs [[17], [18]].

Further research in the twenty first century should be focused on conducting extensive research studies to discover phytochemicals connections to disease prevention because solid evidence is mostly lacking [19]. 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 [19].

b) *Study Limitations*

This research meta-analysis study was restricted by the paucity of qualifying studies that evaluated the relationship between GLV intake and cancer. Thus the findings, although found to be statistically significant cannot be generalized with confidence. An experimental group vs. a control group was not determined as a requirement, so long as the source studies were case-control.

One major limitation in meta-analysis is that for any given research topic, the meta-analyst cannot know for sure how many studies had been conducted but never reported and the results filed away due to lack of significant findings. This "file drawer problem" results in the distribution of effect sizes that are biased and possibly skewed which creates a serious base rate fallacy, in which the significance of the published studies is overestimated [20]. Rosenthal [21] writes that

the heavy reliance on published studies may create exaggerated final results. Thus the decision on whether the fail safe number calculated and reported for each meta-analysis performed in this study, are “realistic”, needs to be determined by the researcher.

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Table 1 : Amounts of Chemical Elements and Phytochemicals in GLV.

GLV	Ca (mg)	Mg (mg)	Folate (µg)	Lutein (µg)	β-carotene (µg)
Broccoli	62	33	168	1,685	1,449
Brussels Sprouts	59	31	94	2,012	725
Cabbage	72	19	45	41	72
Collard Greens	357	38	129	14,619	9,147
Kale	94	23	17	23,720	10,625
Lettuce, Iceberg	10	4	16	152	164
Lettuce, Green Leaf	20	7	21	969	2,488
Lettuce, Butterhead	20	7.2	41	687	1,117
Mustard Greens	104	21	102	8,347	5,312
Spinach	245	157	263	20,354	11,318
Turnip Greens	197	43	170	12,154	6,588
RDA =	1,000 mg	400 mg	400 µg	None	5,000 IU

Table 2 : GLV and CV on cancer qualifying studies showing location and number of subjects (N=case + controls).

Study	Location and (N)	Study	Location and (N)
Chiu et al. (2011)	USA (818)	Glynn et al. (1996)	Finland (420)
Kelemen et al. (2006)	USA (857)	Wu et al. (2009)	USA (2,281)
Kelemen et al. (2008)	USA (2,090)	Fortes et al. (2008)	Italy (609)
Dosil-Diaz et al. (2008)	Spain (617)	Chan et al. (2005)	USA (2,233)
Marchand et al. (2002)	South Pacific (429)	Hardin et al. (2011)	USA (982)
Ruano-Ravina et al. (2002)	Spain (404)	Heck et al. (2008)	India (1,231)
Stidley et al. (2010)	USA (1,101)	Hosona et al. (2010)	Japan (2,430)
Gaudet et al. (2004)	USA (2,963)	Phukan et al. (2001)	India (1,506)
Holtan et al. (2012)	USA (1,610)	Tao et al. (2005)	China (1,678)
Zhang et al. (2002)	China (906)	Cheng et al. (1992)	China (1,998)
Lam et al. (2010)	USA (1,363)	Ambrosone et al. (2004)	USA (1,550)
Brennan et al. (2005)	Europe (4,309)	Carpenter et al. (2009)	USA (933)
Hara et al. (2003)	Japan (781)	Hsu et al. (2007)	Europe (2,574)
Hu et al. (2003)	Canada (6,649)	Hu et al. (2007)	Canada (4,477)
Jain et al. (1999)	Canada (1,253)	Memon et al. (2002)	Kuwait (626)
Olsen et al. (1989)	USA (432)	Slattery et al. (2000)	USA (3,838)
Tang et al. (2010)	USA (2,691)	Mozaheb et al. (2012)	Iran (360)
Chang et al. (2005)	Sweden (1,064)	Annema et al. (2011)	Australia (1,773)
Brock et al. (2012)	USA (2,150)	Vogtmann et al. (2014)	China (1,013)
Grieb et al. (2009)	USA (672)	Jansen et al. (2011)	USA (1,367)
Liu et al. (2012)	China (1,200)	Boa et al. (2012)	China (6,917)
Wakai et al. (2004)	Japan (744)	Norrish et al. (2000)	Asia (797)
Tarrazo-Antelo et al. (2014)	Spain (867)		

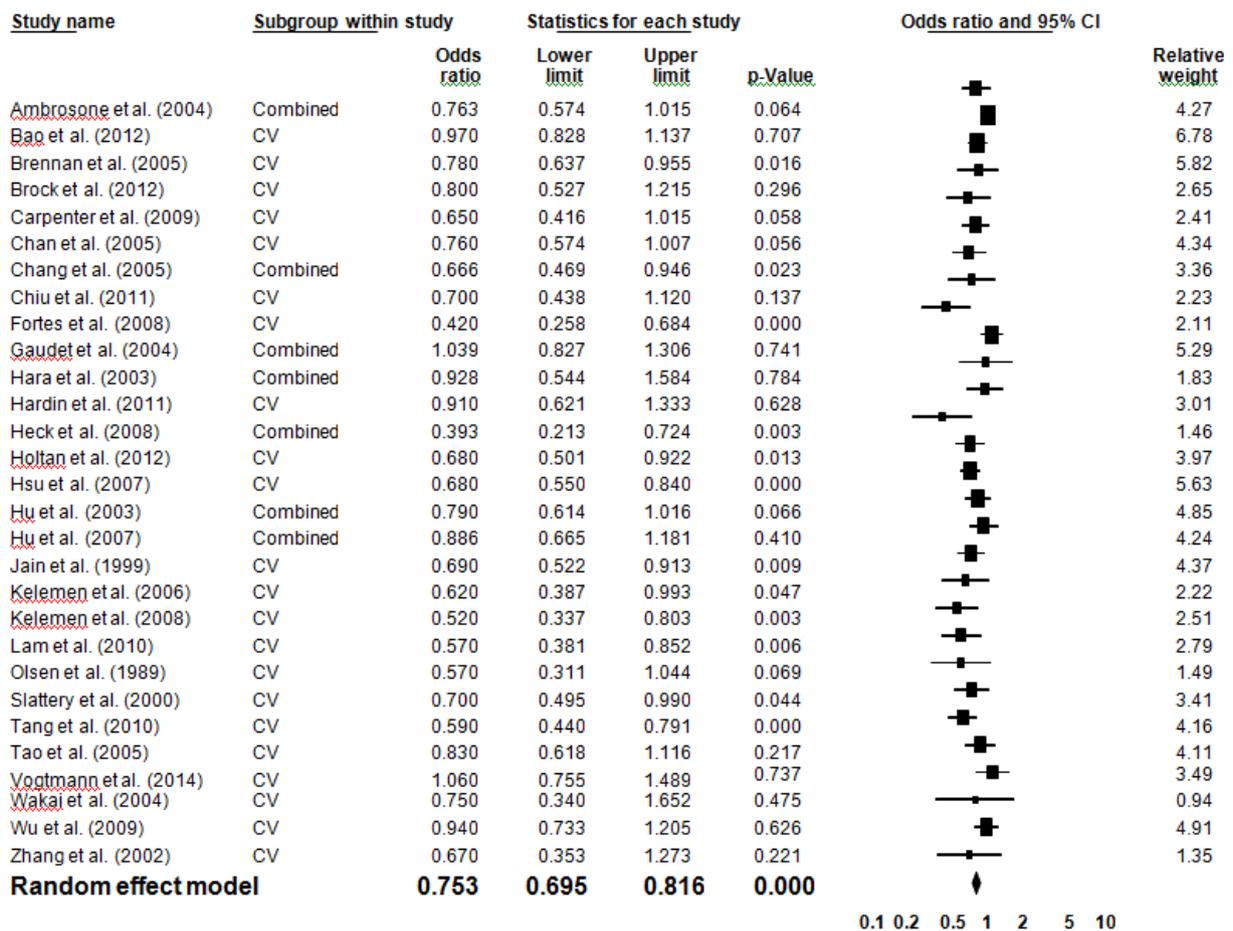


Figure 1 : Forest plot showing a significant 24.7% lower odds of incidence of cancer by consuming a high quantile intake of CV as compared to the lowest intake.

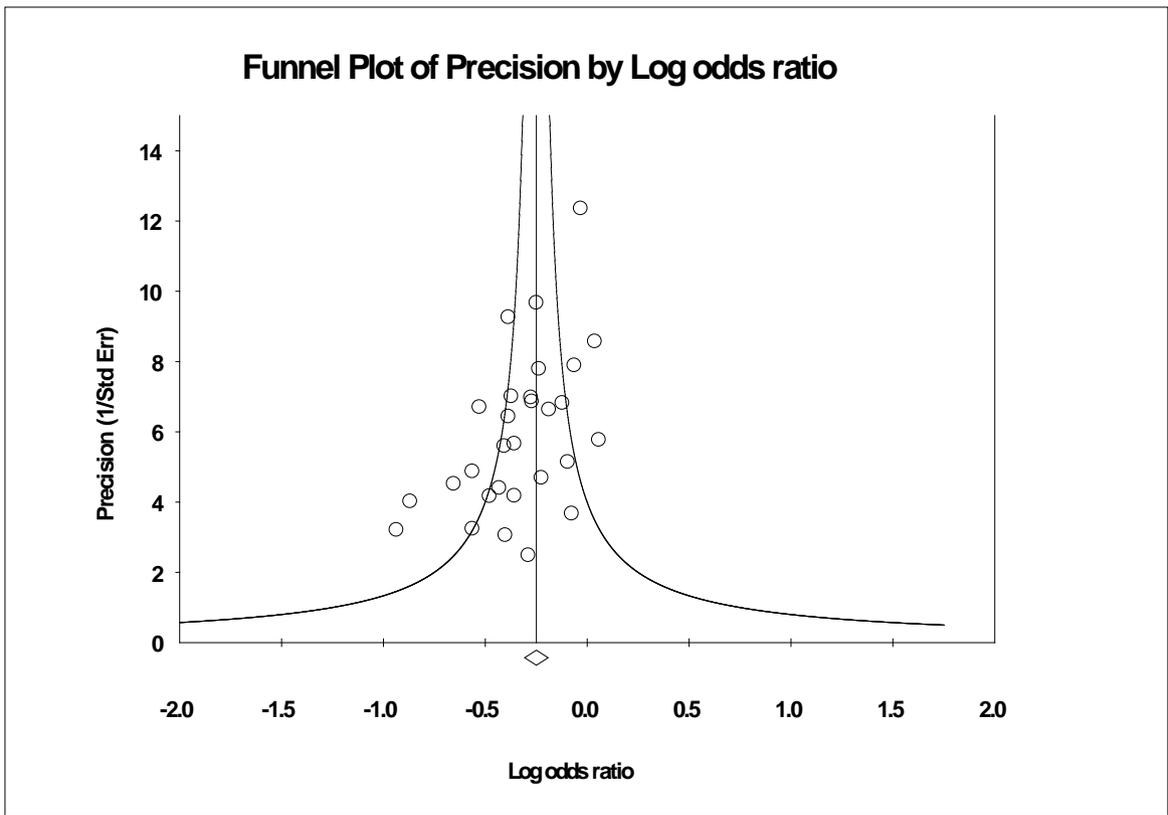


Figure 2 : Funnel plot showing 29 case-control studies with 20 studies on the left of mean log odds ratio and 9 on the right signifying possible presence of publication bias



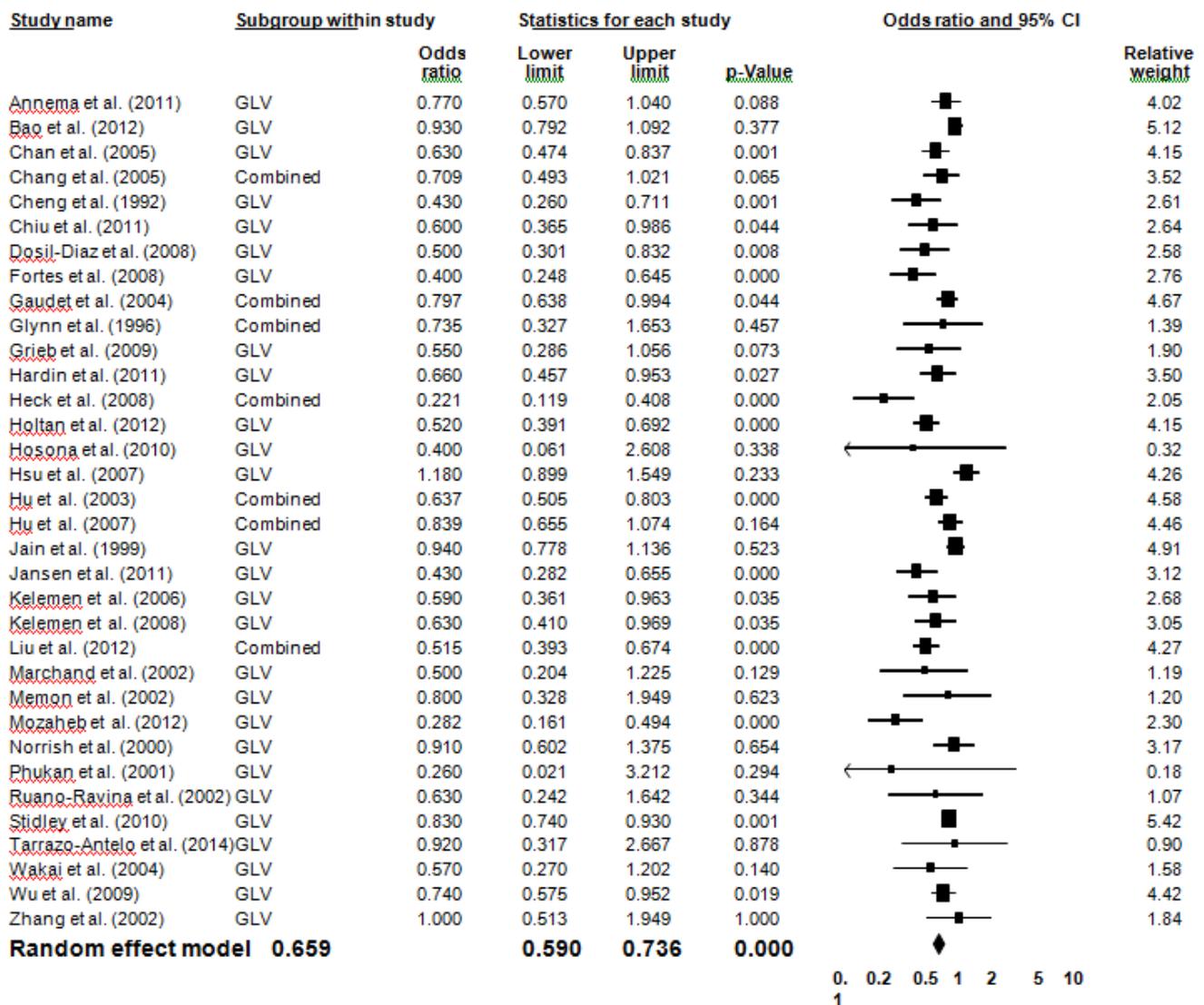


Figure 3 : Forest plot showing a significant 34.1% lower odds of incidence of cancer by consuming a high quantile intake of GLV as compared to the lowest intake.

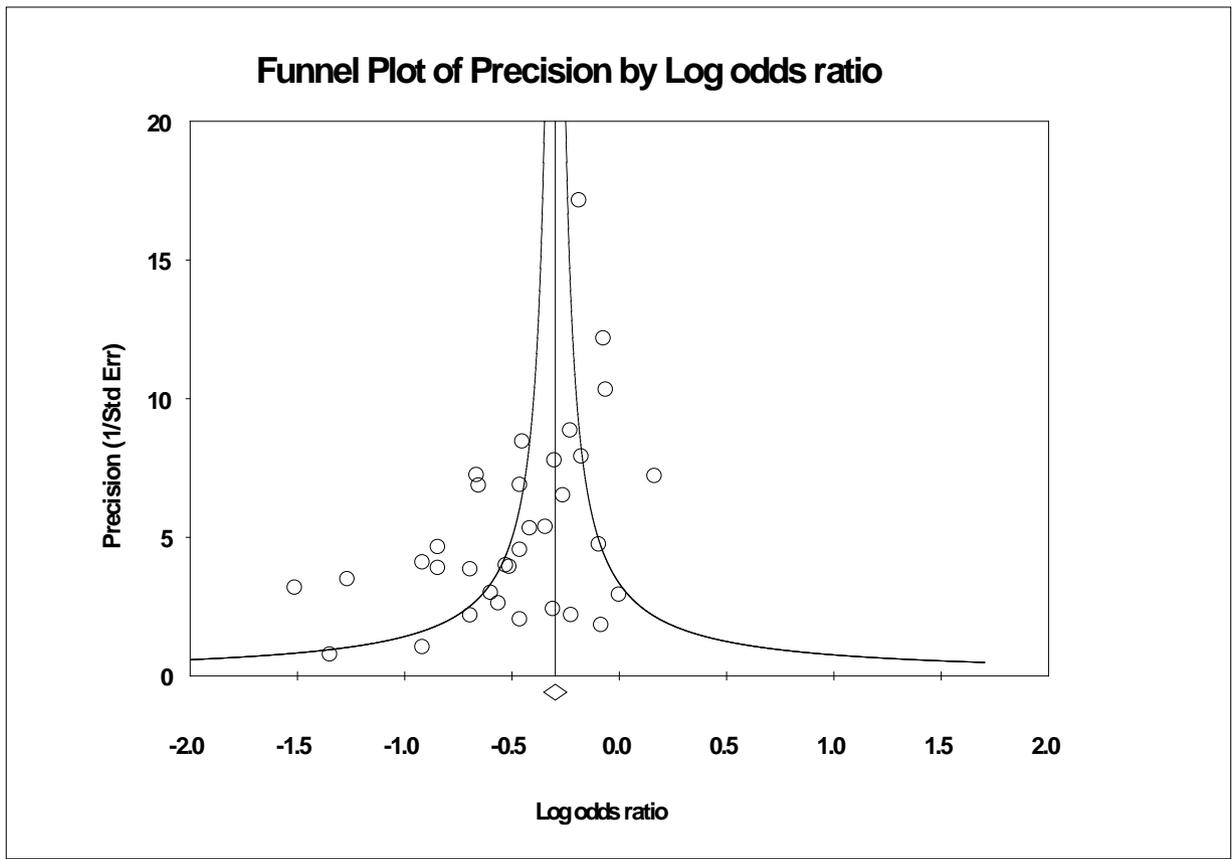


Figure 4 : Funnel plot showing 34 case-control studies with 23 studies on the left of mean log odds ratio and 11 on the right signifying possible presence of publication bias.



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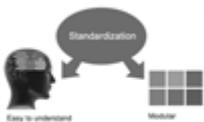
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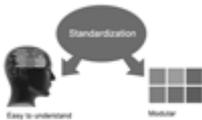


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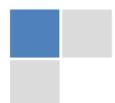
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33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical 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.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

- Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

- Use standard writing style including articles ("a", "the," etc.)
- Keep on paying attention on the research topic of the paper
- Use paragraphs to split each significant point (excluding for the abstract)
- Align the primary line of each section
- Present your points in sound order
- Use present tense to report well accepted
- Use past tense to describe specific results
- Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives
- Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.



Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript-- must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for brevity. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- 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:

- Single section, and succinct
- As an outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an abstract must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.



- 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.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- 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.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

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.



Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- 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.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- 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
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

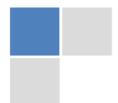
Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- 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>Introduction</i>	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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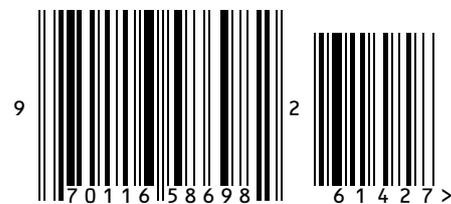
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