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'Malnutrition: A serious concern among hospitalized patients' a cohort study of nutritional screening among admitted patients using GRAZ malnutrition tool- GMT

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Abstract*---Objective:*** To identify the risks, causes, and degree of malnutrition among admitted patients using GRAZ Malnutrition Screening tool with gender and age groups comparison among private and public hospitals. *Materials & Methods:* A comparative cohort

study was conducted upon 385 admitted patients of two Government and private hospitals from 1st Dec- 2019 to 31st March- 2020. A standardized validated tool was used with categories of weight loss within the last 3 months, BMI, changes in appetite, the severity of the disease, and age greater than 65 with a cut-off score of 3. The data was entered and analyzed through SPSS- Version 19 by computing, frequency, percentages, and Chi-Square test, with significant cut-off limit for P-Value was set at 0.05. *Results:* Among the 385 admitted patients 52.2 % (n= 201) were males and 48 % (n=184) females. The vulnerable age group was 39-58 Year with 40 % (n= 157) while 33.5 % (n= 129) were among 28-38 Year. Only 6 % (n= 21) were under-weight with BMI <18 / < 20. The risk of malnutrition among admitted females was 65.7 % (n= 121) as compared to 52.2 % males (n= 105) with GMS >3. Comparing GMS scores of governments and private hospitals, 67.3 % (n= 169) patients of Government hospitals score (GMS >/ Equal to 3) as compared to 61.9 % (n= 83) of private hospitals scored. *Conclusion:* The Government hospitals showed an increased risk of malnutrition, females, overweight, and 39- 58-year age group was the most vulnerable.

***Keywords*---**Nutritional Status, Surgical Patients, Nutritional Assessment, Malnutrition, Nutritional Risk Screening.

Introduction

One among the three are being affected in the global community in relation to nutritional problems. Malnutrition manifests in different ways whereas malnutrition and diet are the biggest risk factor to global burden for disease. Every country is facing a serious public health problem. Economy consequence represents losses of 11 % of gross domestic product (GDP) every year. “Malnutrition refers to deficiencies; excesses or imbalances in a person intake of energy or nutrients. It covers under nutrition i. e stunting (low weight and age), wasting (low weight or height), underweight (low weight for age) and micronutrients for deficiencies, along with overweight, obesity and diet related non communicable diseases (heart diseases, stroke, diabetes and cancer)”. The European Society for clinical Nutrition and Metabolism (ESPEN) defines malnutrition as a state of nutrition with deficiency or excess (imbalance) of energy, protein and other nutrients causes measurable adverse effects on body form and function, as well as clinical outcome [1, 2, 3, 4].

Globally 1.9 billion adults are overweight while 462 billion are underweight. Among children 52 million under 5 year are wasted while 17 million are severely wasted 155 million are stunted while 41 million are overweight or obese. While 53.9% of elderly population have normal weight among them 15.8% were underweight, 24.2% were malnutrition intake, severity of disease <age above 65 years [5].

The nutritional assessment is the crucial step in a productive economic life of a patient. Therefore, it identifies the risk groups, help in diagnosing the vulnerable

individuals with their deficiencies as setting up a baseline to facilitate early treatment thus decreasing the mortality and morbidity of imbalanced nutrition. Malnutrition is common worldwide in community and hospitalized patients. The hospitalized patient malnutrition is the combination of cachexia and inadequate consumption of nutrients associated with greater mortality rate, delayed recovery and increased cost of medical care. More over the health of the patient is directly related to the stay of patient and lack of awareness, further aggravated by negligence of medical staff. Therefore, patient's screening at admission is must to enable the nutritionist to identify and enable a proper timely intervention [4, 5, 7, 8, 9, 10].

The 40 per cent people in hospitals are malnourished as per ESPEN. While a great number of admitted patients are undernourished who further develop malnourishment during their stay. This condition could be treated only if attention is given to the nutritional status, both on admission, during stay and after discharge of patient". The problem of malnutrition remains mainly unrecognised in hospitals with lack of widely accepted screening system. Therefore, a hospital needs to adopt a set of protocols for early detection of people at risk [5, 6, 8].

The tools used for screening malnutrition include Anthropometric measurements, MST- malnutrition screening tool, MNA- mini nutritional assessment, MUST- malnutrition universal screening tool, NRS-2002 (nutrition risk screening, SGA- subjective global assessment, SCREEN- senior in community risk evaluation for eating and nutrition and recently a new validated tool as GRAZ malnutrition screening tool. It was developed for the purpose of malnutrition risk screening in General Hospital GRAZ. The GRAZ malnutrition screening tool had the advantage over other malnutrition screening tools because it is user friendly and involves dietarians in an automated manner. GMS assures the multi professional approach and quality control. The GMS consists of 5 different scoring categories and weight loss within last 3 months [11]. The need for the assessment of nutritional status is mandatory in such a dilemma. The aim of nutritional assessment is to identify the at risk, their referral and treatment. This is fundamental to prevent or reverse the associated negative clinical outcomes for malnourished patients. Thus, routine screening could be the foundation for dietetic recommendation for direction of appropriate nutrition support [12, 13]. Lack of awareness or negligence among the staff has been reported to be one of the causes for malnutrition in hospitalised patients. Therefore, nutritional assessments of patients through validated tools will enable the nutritionist to appropriately identify the malnourished patients and provide them with timely treatment with effective counselling. The timely nutritional intervention improves the nutritional status of hospitalised patients [13].

Malnutrition in admitted patients is prevalent although most neglected component. Proper diagnosis is essential for an individualized nutrition therapy to be started early through the healthcare team. Studies regarding changes in nutritional status of patients during hospitalization have been reported but despite such finding the problem of malnutrition in hospitals remains unrecognized. The data regarding malnutrition among admitted patients of Pakistan is scarce. Furthermore, researchers intend to solve the problem by early

screening of malnutrition through a validated tool “GRAZ Malnutrition Screening” tool which has never been used in Pakistan before to the best of researcher’s knowledge. Despite high prevalence rates of malnutrition in hospitals, awareness of medical and nursing staff is still rather low which will be raised through this study.

Materials & Methods

A comparative descriptive study was conducted in the Medical and Surgical Units of four leading Hospitals of District Peshawar in Khyber Pakhtunkhwa (Pakistan). The study included two Government (Lady Reading and Khyber Teaching) and two Private (Kuwait and Mercy Teaching) Hospitals. Data was collected between 1st December 2019 and 9th 31st March 2020. The total sample size 385 was calculated with a 95% confidence interval, 5% of margin of error, and with addition of a 10% non-response rate of the participants through online calculators [14]. Convenient sampling technique used as these hospitals get patients from all over the province so no further randomization was needed. The selection of the hospitals was randomly done through the lottery method.

Three hundred and eight-five admitted hospitalized patients both male and female above 18 years of age, able to give consent, admitted on that day or a day before were enrolled in the study, however, Pregnant ladies, lactating mothers, children and out Patient cases, who cannot communicate as well as mentally ill patients (chronically ill patients) were excluded from our study. Among the total included patients, 201 were male and 184 females. The patients admitted in Lady Reading (LR) were 136, 115 in Khyber Teaching (KT), 78 in Kuwait Teaching, and 56 in Mercy Teaching Hospitals. A structured validated GRAZ Malnutrition Screening (GMS) tool was used in the study which was translated into the national language (Urdu) and further validated from a group of six specialist doctors working in Medical and Surgical units, through DELPHI technique. The five scoring categories of the tool were Weight Loss within last 3 months, BMI, Changes in malnutrition intake, Severity of disease, Age above 65 years. GMS tool’s first part had BMI, stool, and dietary patterns while the second part comprised the severity of the disease. A score of 3 or more signified ‘risk of malnutrition’.

Data was collected through interview-based questionnaires. The weight and height of the patient were noted from the written records of the patient otherwise were measured at that instant. The severity of the disease was marked by the physician’s diagnosis. This tool identified the individual at risk of malnutrition, while the degree of malnutrition was calculated from BMI. Ethical approval for the study was taken from the Institutional Ethical Review Committee (Prime/ERC/2019-03).

Age, gender, weight, height, BMI, weight loss within 3 months, nausea /vomiting, difficulty in chewing or swallowing, loss of appetite, chronicity of disease and age above 65 years were the variables of interest identified prior to the study. All the collected data were stored electronically and then entered into SPSS Version- 19 for analysis. Descriptive statistics computed through frequency, percentages, however, Inferential statistics for comparison among age groups, gender and

public private hospitals was through the Chi-Square test, with the P-Value significance set at 0.05.

Results

The total 385 study participants were assessed for their nutritional status on admission. Both male and female of age 18 and above were admitted in four leading hospitals of Peshawar. Two government hospitals (Khyber Teaching Hospital KTH, Lady Reading Hospital LRH) and two Private hospitals (Mercy Teaching Hospital MTH and Kuwait Teaching Hospital KTH). The patients admitted in LRH were 35.3% (n=136), KTH had 30 % (n= 115), Kuwait teaching hospital had 20.2% (n= 78) and MTH with 14.5% (n= 56). Among the total admitted hospitalized patients, 52.2 % (n=201) were males and 184 (48 %) were females. Majority 339 (88 %) of responders were married, with 10.9 % (n=42) un-married / single and only 1% widows. The age stratification of 385 patients at the time of admission to government and private hospitals was 40 % (n=150) were of age ranging from 39-58 years while 33.5 % (n=129) patients were from 18-38 years, 24.9 % (n=96) patients of 59-78 years, and only 25.9% (n=10) patients belonged to >78 years. The total admitted males of the study were 201, out of which 105 were at risk of malnutrition whereas, 96 were normal. The total at risk of malnutrition were 226 (58.7%) however, 159 (41.3%) were not. The calculated GMS scores of less than 3 were in 133 (34.55) and more than 3 were scored by 252 (65.5%).

BMI was compared with age of patient that showed 317 over-weight patients (BMI >20/ > 22), 128 patients were of age 39-58 years, 98 patients with age group 18-38 years, while only 10 patients had age >78 years. While on the other hand 21 (5.55%) were underweight admitted patients and 8 patients were of age 18-38 years, with 7 patients from age 39-58 years and 6 patients among age 59-78, showing malnourishment more pronounced in younger aged patients. The male patients admitted in KTH and Kuwait Teaching Hospital were more prone to increased risk of being Malnourished while the females admitted in LRH and Mercy Teaching Hospital had increased risk of Malnutrition. Among the age group, 39-58 years were more prone to increase risk of being malnourished (over-weight/ under-weight) as 26 (22.6 %) patients in KTH, 26 (19.1 %) LRH and 10 (33.9 %) patients of Mercy, while 16 (20.5 %) patients of Kuwait of age 39-58 years had increased risk as assessed by GMS SCORES.

The risk of malnutrition as assessed by GRAZ MALNUTRITION TOOL. GM Scoring system when applied on all admitted patients among 385, 133 (34.5 5) scored GMS < (less than 3) had no risk while majority 252 (65.5 %) patients were at increased risk of malnutrition as they scored GMS equal or > than 3. (Standard cut off value for risk of malnutrition GMS=3, above which signifies increase risk and below which signifies no risk). The risk of malnutrition was found in 121/184 admitted females with 65.7 % and GMS >3 i. e had increased risk as compared with 105/201 admitted males with 52.2 % at increased risk and scoring GMS >3. Nutritional statuses of all the admitted patients were evaluated in both government and private hospitals, among the total 385 enrolled participants 251 were admitted in in government hospitals with 115 (30.01 %) in KTH (Khyber Teaching Hospital), and 136 (35.31 %) in LRH (Lady Reading Hospital). However,

few like 134 out of 385 patients were admitted in private hospitals. Among them 78 (20.22 %) patients were admitted in Kuwait Teaching Hospital while 74 (55.22 %) of patients in Mercy Teaching Hospital. In the patients of KTH, majority 77 (67 .01%) were males and 38 (33.21 %) females, however among 136 admitted in LRH majority 72 (53.10 %) were females and 64 (47.11 %) were males. On other hand, in private hospitals Kuwait and Mercy teaching Hospitals, majority of admitted patients (74 (55.23 %) were females, with remaining 60 (44.72 %) males. Almost all the private hospitalized patients 119 (89.03 %) were married, however in patients admitted in government hospitals 220 (87.61%) patients were married with only 12 (4.74 %) patients un-married. In KTH 87 (75.62 %) of patients with acute diseases were admitted in medicine ward, with remaining 28 (24.3 %) in surgery ward. However, majority 75 (55.12 %) of them had acute disease admitted in surgical ward, with 61 (45.01 %) patients in medicine ward of LRH. On the opposite side, both 81 (60.43 %) male and female patients of private Mercy and Kuwait were admitted in medicine ward, with remaining 53 (40.14 %) patients in surgery ward. The prevalence of admitted patients at risk of malnutrition is depicted in Figure- 1. The admitted patients were segregated as per age and the risk of malnutrition is depicted in the Figure- 2. GRAZ tool assessed the scores to quantify malnutrition risk among all the admitted patients of the included hospitals. Increased risk of being malnourished depicted among the patients of the Government Hospitals as shown in Figure- 3. Figure- 4 shows the gender-based prevalence of admitted patients at risk of malnutrition. The male patients of Khyber and Kuwait Teaching Hospital more prone to increased risk of malnourishment while the females admitted in Lady reading and Mercy Teaching Hospital had increased risk of Malnutrition as per gender wise distribution of malnutrition risk according to GRAZ tool.

Discussion

This study concluded malnutrition among 39- 58 years of the admitted patients, mostly over-weight, with acute diseases and 65 % patients scored >3 GMS and had increased risk of being malnutrition and females were more prone to malnutrition. The patients admitted in government hospitals were more at risk of being malnourished and males of KTH and Kuwait Teaching hospitals scored >3, while females of LRH and Mercy Teaching Hospital were at increased risk of being malnourished.

The various studies identified the frequency of malnutrition on admission to hospital in patients with a wide variety of disease states. Some researchers [1] used data on body mass index and mid-arm circumference and compared with data with population of the United Kingdom. The criteria that the present researchers used to determine malnutrition was derived from previously published study [11] which used scoring system of assessing the risk of malnutrition. European, American and South American data in comparable settings reflect similar malnutrition rates to Australia. A study reported a 27% rate of malnutrition (using SGA), with malnourished patients having a LOS 43% longer than well-nourished patients (20). Two further studies using SGA reported prevalence rates of malnutrition of 48% and 45% with again poor medical documentation and longer LOS in malnourished patients [6]. The nutritional status of the patients on admission to hospital was significantly poorer to the general population. The

overall prevalence of under nutrition on admission to hospital was 40%. However, in the present study the prevalence of malnutrition as overweight (82.3 %) as assessed by BMI, the reason for this may be that this group was more likely to have been referred for admission at that time. but they also reassessed patients on discharge which showed a greater weight loss which is missing in our study. Numerous nutrition screening and assessment tools are used to identify the risk of, and diagnose, malnutrition. Recent evidence-based practice guidelines published by the Dieticians Association of Australia considered levels of evidence for validated screening and assessment tools in the acute setting [15]. They reported on five screening and three assessment tools validated for use in the acute setting which are as:- The MST is a simple, three-question tool assessing recent weight and appetite loss [15, 16] with a scoring system to identify patients at high nutrition risk Related to the MST, MUST was developed to detect both under-nutrition and obesity by measuring BMI, unplanned weight loss and the presence or absence of serious disease allow a score to be derived to indicate whether nutrition intervention is necessary. The MNA was developed specifically for use among elderly patients (≥65 years) in hospitals, nursing homes and the community [16, 19] using anthropometrical, medical, lifestyle, dietary and psychosocial factors in an 18 item assessment, using a points-based scoring system, another NRS-2002 used recent weight loss, decreased BMI and reduced dietary intake, combined with a subjective assessment of disease severity (based on increased nutrition requirements and/or metabolic stress), to generate a nutrition risk score [13, 16, 19]. SGA is one of the most commonly used nutrition assessment tools for nutrition status via completion of a questionnaire for weight change, dietary intake change, gastrointestinal symptoms, changes in functional capacity in relation to malnutrition as well as assessment of fat and muscle stores and the presence of oedema. This tool allows for malnutrition diagnosis, and classifies patients as either: A—well-nourished; B—mildly/moderately malnourished; or C—severely malnourished however, the present researchers selected GRAZ MALNUTRITION SCREENING TOOL as a mixture of all tools for assessing malnourishment, with BMI, dietary and stool patterns then classify risk of malnutrition according to underlying diseases and the age >65 years as average age for this study population. A study [11] indicated a high validity of GMS compared with malnutrition screening tools recommended for hospital use (Pearson's r values of 0·78 according to the NRS and even higher, 0·84 compared with the MNA-so) made it more accessible to use, with the usefulness of malnutrition risk screening tools with efficacy as major importance. ESPEN recommends four different variables to be included in a hospital nutrition screening tool [5] anthropometric parameters, recent weight loss, individual food intake and its history and disease process and nutritional needs. The GMS tool addresses all the items recommended within the ESPEN Guideline for use in hospitals as it is very user-friendly and that it can be incorporated into any hospital platform due to which we wanted to use this tool for our setting [11], but as this tool involves dietarians in an automated manner if malnutrition risk is detected in a patient screened by the staff on the wards which is due to limited resources lacking in this study.

Malnutrition prevalence in the hospital setting had been widely documented in the literature between 20% and 50%, depending on the patient population, definition and criteria used for diagnosis [3, 6, 22], rather than only reporting on malnutrition rates, many of these aforementioned malnutrition prevalence studies

have also considered other aspects of patient care affected by malnutrition, namely length of stay (LOS), medication use, infection rates, dietetic referrals, documentation of malnutrition and mortality [12]. An Australian study [20] reported malnutrition in 23% of 275 patients randomly assessed by SGA on admission. They found malnourished patients had a significantly longer LOS by 4.5 days compared to well-nourished patients and dietarian was only referred to 36% of these patients during their admission, and only 7 out of 24 cases (29%) were correctly documented in the medical history as such by the dietarian. Further Australian studies showed similar results to the study previously described. In 2007, SGA was used to assess the nutritional status of patients in a private hospital and reported a malnutrition rate of 42%, with only 15% of these patients referred to a dietician [23]. In a study from Spain shows that majority of admitted were found to be overweight, they found the frequency of malnutrition varied from 72.7% assessed by anthropometry (under nutrition in 26.7% and over nutrition in 46.0%), to 46% using SGA. Malnutrition was not related to the type of admission [24] which corresponds with this study finding, that majority of admitted patients were obese, malnourished and it maybe is due to the acute disease consequences due to which they have weight gain. Thus, it is clear from the number of published studies; malnutrition is a worldwide problem with poor diagnosis and documentation rates and higher LOS and infection rates commonly reported.

An analytical prospective study conducted at Tertiary Care hospital upon admitted children of one month to fifteen years tools used were clinical data, anthropometric measures and screening tool STAMP. STAMP tool revealed 50% children on admission at high risk of malnutrition, with association of severity of disease and length of stay in the hospital [25]. Another study used SNAG (Short Nutritional Assessment Questionnaire) tool for the nutritional assessment of thousand admitted patients from medical wards. Body mass index, haemoglobin and albumin levels were also measured. The results revealed 550 patients as malnourished with SNAG score>2, anaemia and hypoalbuminemia were found to be significant in malnourished patients. Length of stay in hospital was also significantly associated with higher SNAG scores however, inversely associated with BMI scores [26]. A dietician-led prospective study was done in three phases with objectives of malnutrition prevalence, sensitization of the dieticians and use of multidisciplinary team for oral nutritional supplements timely delivery. The results revealed marked improvement in their nutritional diagnosis and there was reduced stay in the hospital [27]. The conclusions of all three studies were contrary to the present study as different tools were used with varying objectives.

A retrospective study was conducted in Geriatric Research Hospital of Italy, upon 284 patients and used MUST (Malnutritional Universal Screening Tool), after comparing it with ESPEN by European Association of Clinical Nutrition and compared malnourished patients with non-malnourished ones. The results showed high risk of malnutrition at the time of admission and a strong predictor for the longer duration stay in hospital and mortality [28]. A review article described the screening of nutritional status and use of quick and easy assessment tools that played a remarkable role in the effective nutrition management of the admitted patients. It must follow a multidisciplinary approach to combat with the problem [29]. A Chinese study used NRS- 2002 (Nutritional Risk Screening 2002) and MNA- SF (Mini Nutritional Assessment- Short Forms upon 745 elderly

admitted patients to determine nutritional status on admission, with anthropometric measures, laboratory investigations, personal information, nutritional support and effects of clinical outcomes were recorded. Results showed higher nutritional risk among gastrointestinal patients as compared to other departments [30]. A study validated three tools for liver cirrhosis patients, namely MNA-SF, NRS-2002 and GMS against recommended tool for cirrhotic patients i. e RFH-NPT. Among these MNA-SF scored highest with 80% sensitivity but 17% false negative results as compared to the recommended tool. However, GMS and NRS-2002 had unacceptable rates, sensitivity and high false negative results. At the end correlations done and MNA- SF was chosen to be easy and user-friendly tool for liver cirrhosis [31]. The present study chose only one tool.

A study revealed independent predictors of hospital stay duration with disease duration, surgical intervention, BMI and MUAC for nutritional status and concluded that nutritional screening on admission is must for every admitted patient with identification of deficiencies. During the hospital stay they should be given supplements according to their results so that they remain safe in hospital environment [32]. These were not similar to this study results. Limitations of the study were that a single screening tool GRAZ malnutrition used. No gold standard was there for comparison. Dieticians were not available for further screening as blinded study. Data from registers was taken, wherever available so authenticity would be dubious.

Conclusion

This study concluded malnutrition among 39- 58 years of the admitted patients and mostly over-weight. Majority of patients were diagnosed with acute diseases and 65 % patients scored >3 GMS and had increased risk of being malnutrition and females were more prone to malnutrition.

The patients admitted in government hospitals were more at risk of being malnourished and males of KTH and Kuwait Teaching hospitals scored >3, while females of LRH and Mercy Teaching Hospital were at increased risk of being malnourished.

The recommendations regarding the results and for future are as a malnutrition screening tool refers to the detection of 'risk of malnutrition 'in hospital admitted patients, so there is a great need for subsequent further assessment and treatment. It is recommended to adopt such measures in which the malnourished patients are identified earlier by using specific screening tools and then they must be provided with prompt early treatment and proper referral to the dietarians to evaluate deficiencies and provide them complete treatment, counselling with follow up records.

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Graz Malnutrition Screening (GMS) Tool

Date of birth*:
Weight (kg):
Height (m):
BMI = (kg/m^2):

Items 1 to 3: evaluation by nurse

1. Weight loss within the last 3 months?

Current weight:_____ Weight 3 months ago:_____

Evaluation weight loss:			
<5 %	=	0 points:	☐
5–10%	=	1 points:	☐
>10 %	=	2 points:	☐

2. Body Mass Index (BMI) (kg/m^2)

For patients *up to* 65 years:	For patients 65 years or older:		
BMI: >20	BMI: >22	0 points:	☐
BMI: 18–20	BMI: 20–22	1 points:	☐
BMI: <18	BMI: <20	2 points:	☐

3. Decrease of food intake within the last months was due to:

Loss of appetite	No: ○	Yes = 1 point:	☐
Problems with chewing and swallowing	No: ○	Yes = 1 point:	☐
Nausea, vomiting, diarrhoea	No: ○	Yes = 1 point:	☐

4. Severity of disease: *ICD-10 classification by physician*

Choose either 4a OR 4b. In 4a the presence of any of these condition will be awarded 1 point. In 4b the presence of any of these conditions will be awarded 2 points.

a) Malignant systemic disease (without chemo-/radiotherapy)
Preterminal renal failure (serum creatinine > 5 mg/dl)
Acute gastrointestinal infection
Maldigestion
Chronic alcohol abuse
Decompensated liver cirrhosis (CHILD C)
Systemic amyloidosis
COPD stage ≥ III
Heart failure NYHA class ≥ III
Neurogenic dysphagia
Wounds NPUAP stage I + II
Polypharmacy > 5 drugs — 1 point: ☐

b) Advanced malignant systemic disease
Sepsis
Wound NPUAP stage III + IV
Malabsorption syndrome
Chemo-/radiotherapy (longer than 1 week) — 2 points: ☐

* +1 point if 65 years or older — 1 point: ☐

GMS Score ≥ 3 = malnutrition, ICD-10 code: E46

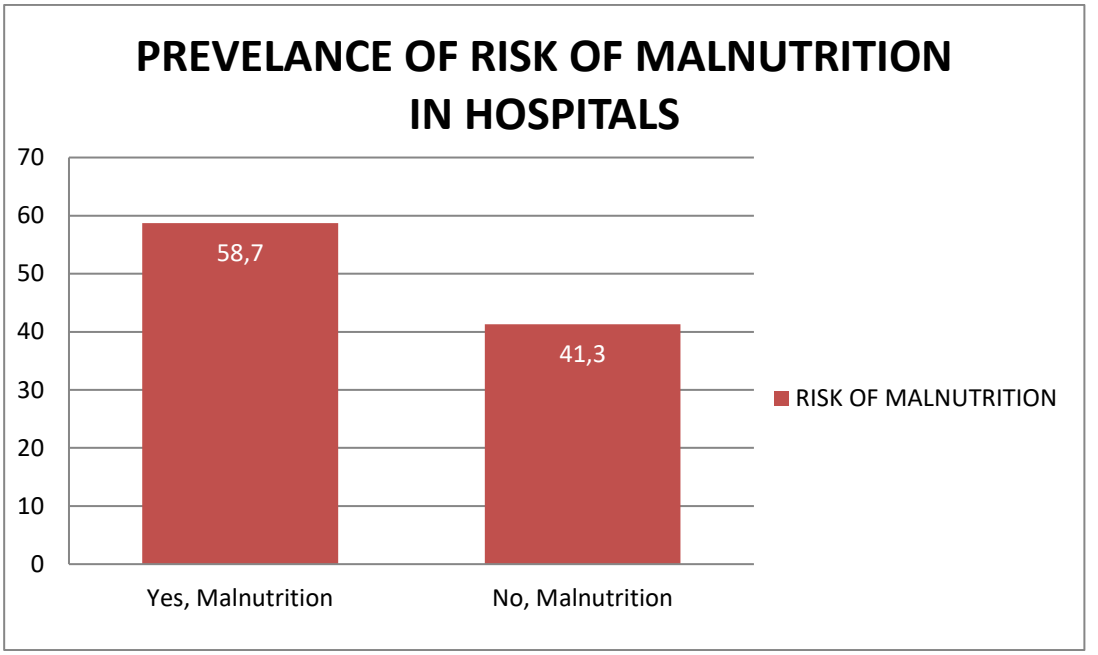

Figure 1: Prevalence of Admitted Patients at Risk of Malnutrition

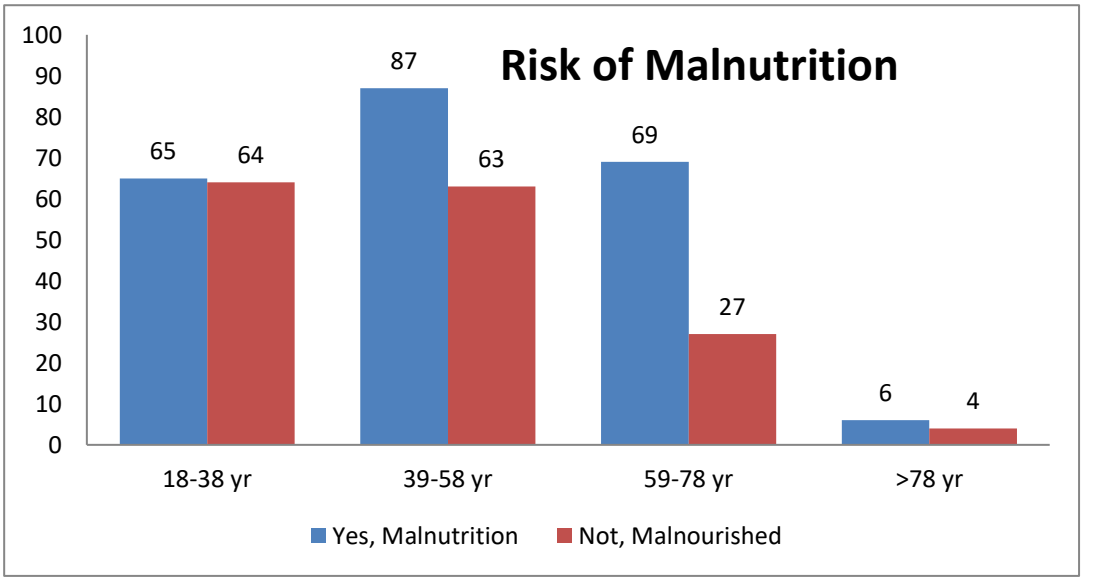

Figure 2: Age-Group Stratification of Admitted Patients at risk of Malnutrition

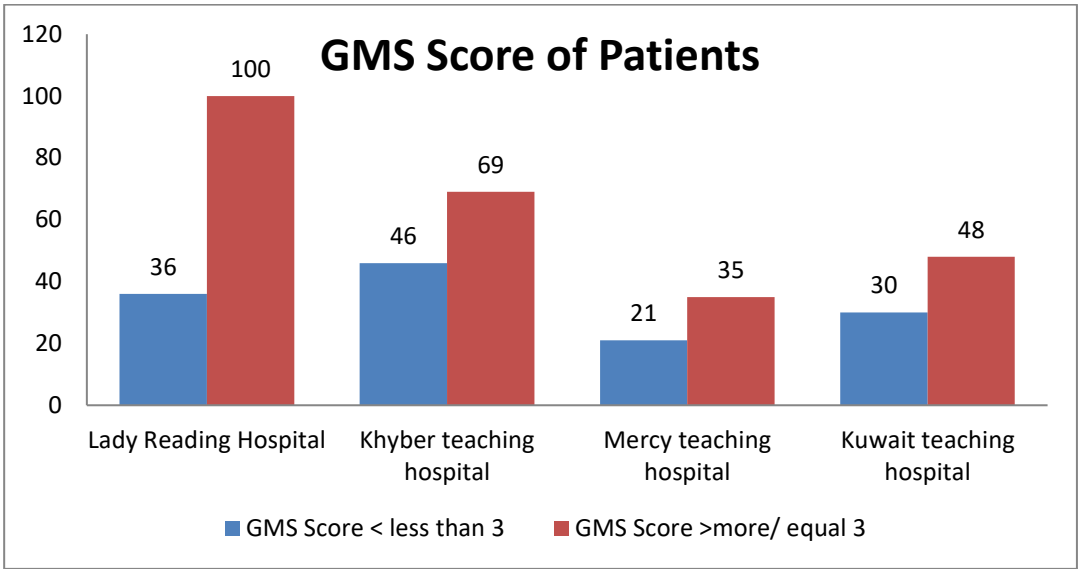

Figure 3: GRAZ Malnutrition Screening Scores of Admitted Patients

Note; GMS =3 standard cut off value, above which is increased risk, below which is no risk.

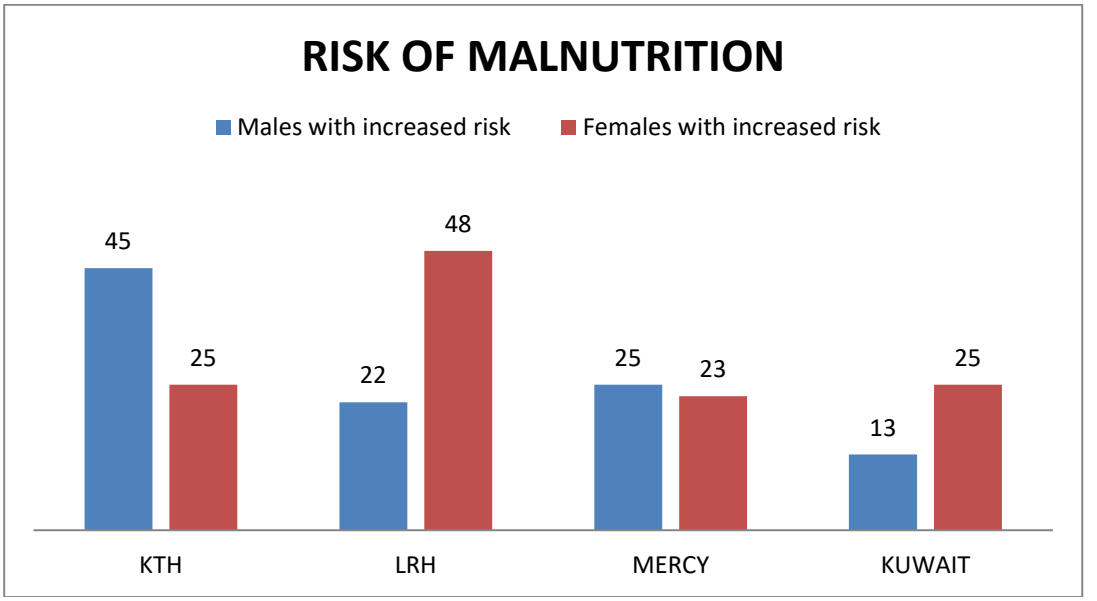

Figure 4: Gender based Prevalence of at Risk of Malnutrition

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