Knowledge and Awareness of Nursing Students at King Abdulaziz University Regarding Vitamin B12 Deficiency Anemia

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Abstract

Background: The prevalence of vitamin B12 insufficiency is considerable worldwide with adult. Deficits in vitamin B12 are linked to neurological and hematological problems. Nursing education plays a crucial role in shaping the knowledge base of future nursing professionals, preparing them to address the dynamic challenges of the healthcare environment. **Aim:** This study aims to assess the knowledge and awareness of Nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia**. Methods:** A descriptive quantitative cross-sectional design used to assess the knowledge and awareness of Nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia. Data collected using online survey questionnaire that disseminated through social media among second, third and fourth year nursing students. **Results:** Most of nursing student had good awareness regarding Vitamin B deficiency anemia was. While less than half of them had good knowledge regarding to Vitamin B deficiency anemia. It was concluded that about two third of nursing students at King Abdulaziz University had satisfactory level of awareness while less than half of them had satisfactory level of knowledge regarding vitamin B12 insufficiency anemia.

Keywords: vitamin B12 deficiency; anemia; awareness; knowledge and Nursing students.

Introduction

Nursing knowledge encompasses a diverse range of theoretical and practical understanding that essential for delivering effective patient care, promoting health, and contributing to the overall well-being of individuals and communities. It involves a combination of clinical skills, critical thinking, evidence-based practice, and a solid foundation in healthcare sciences. Nursing education plays a crucial role in shaping the knowledge base of future nursing professionals, preparing them to address the dynamic challenges of the healthcare environment (**Dinmohammadi et al., 2017**).

Anemia is a disorder where the blood's ability to carry oxygen is reduced due to either a low hemoglobin or red blood cell count. It is a common hematological disorder that affects one third of the population. Globally, It is a common condition associated with significant increase in mortality, morbidity, decreased productivity at work, and impairment of neurological development (**Asghar et al., 2021**). Clinically, individuals are identified as anemic if their hemoglobin level is less than 11 g/dL of blood (**Asghar et al., 2021**).

About half of the world's anemic people suffer from iron deficiency, which is one of the main causes of anemia. Other micronutrient deficiencies can also cause anemia, including folate, vitamins A and B12, and riboflavin. Anemia can also result from a number of inherited or acquired disorders, including thalassemia, as well as from chronic diseases like tuberculosis, cancer, HIV/AIDS, and malaria (**Kundu et al., 2023**).

There are three main categories of hypo proliferative anemia based on mean corpuscular volume (MCV). The first type is microcytic anemia MCV less than 80fl (Iron deficiency anemia, anemia of chronic diseases, sidero-blastic anemia, thalassemia, and lead poisoning). The second type is normocytic anemia 80-100fl (real failure, anemia of chronic disease, aplastic anemia, pure red cell aplasia, myelofibrosis, and multiple myeloma). The third type is macrocytic anemia MCV more than 100fl (alcohol, liver disease, hypothyroidism, folate and vitamin B 12

deficiency, melody's plastic syndrome, and drug-induced causes) (**Asghar et al., 2021**).

The primary causes of anemia in developing countries are genetics, red blood cells destruction due to infection, and inadequate intake of micronutrients, which are primarily iron, vitamin B12, and folate (**Al-Sejari, 2020**). Vitamin B12 is vitamin that is derived from foods high in animal products, also known as cobalamin. After absorption, B12 is utilized as an enzyme cofactor for fatty acid, myelin, and DNA synthesis. Because of this, a B12 deficiency may cause neurological and hematologic problems (**Ankar& Kumar, 2023**).

All cells require vitamin B12 in order to operate properly. The prevalence of vitamin B12 insufficiency is considerable worldwide, with adults and the elderly being especially vulnerable. Deficits in vitamin B12 are linked to neurological and hematological problems. Age-related variations in vitamin B12 insufficiency have been noted. A vitamin B12 deficiency can impact people of all ages (**Gyawali et al.,2023**).

Individuals who lack vitamin B12 ought to be informed about their situation. as part of its management. A vitamin B12 deficiency can cause a variety of symptoms, such as fatigue, glossitis and neurological manifestations. Through an initial patient questionnaire, with a sample of 105 patients, it was reported that patients 'knowledge about their condition was very low. Additionally, a baseline audit measuring showed only 10% compliance. Furthermore, nursing staff reported not having an educational tool available, and this resulted in the verbal information given to patients being inconsistent (**Ortet-Walker et al., 2019**).

A hidden illness that negatively impacts many people's quality of life in the UK is vitamin B12 deficiency. First In the UK, its estimated prevalence is around 6% (**Tyler et al., 2022**). According to reports, the prevalence of vitamin B12 deficiency in Americans is as high as 3% in people ages 20 to 39, 4% in people ages 40 to 59, and 6% in people ages 60 and above (**Yousaf et al., 2021).**

Significance of the study:

Despite the critical role of nurses in identifying and managing nutritional deficiencies, there is limited research on their understanding of vitamin B12 deficiency and its implications. This knowledge gap raises questions about the level of knowledge and awareness of nursing students to recognize, assess, and address vitamin B12 deficiency anemia in clinical settings.

Studies have highlighted the significance of nutritional education for nursing students, emphasizing its direct impact on patient outcomes (**Saeed et al., 2020;Khalaf et al., 2019)**. However, within the context of King Abdulaziz University, limited research has been conducted to assess the specific knowledge and awareness levels of nursing students concerning vitamin B12 deficiency anemia.

Understanding the current state of awareness is crucial for tailoring educational interventions to address potential gaps in the curriculum. (**AlBuhairan et al 2019**) demonstrated that targeted educational programs significantly improved nursing students' knowledge and awareness of nutritional issues. Therefore, an exploration of the existing knowledge base among nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia is essential to inform educational strategies and curriculum development.

Aim of the Study

This study aims to assess the knowledge and awareness of Nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia.

Research Question

- To what extent do the Nursing students at King Abdulaziz University know about vitamin B12 deficiency anemia?
- To what extent do the Nursing students at King Abdulaziz University aware about vitamin B12 deficiency anemia?

3. Methodology

Design: A descriptive quantitative cross-sectional design. used to answer the proposed research questions. This design used in the study to assess the Knowledge and awareness of Nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia.

Study setting: This study conducted at Faculty of Nursing, King Abdulaziz University in Jeddah City with an online survey questionnaire .

Sample and sample size: A Convenience sample used for the data collection. The total number of nursing students at Faculty of Nursing, King Abdulaziz University in Jeddah City is 572, calculated sample size will be 231, calculated according to Sample Size Calculator application to be confirmed with the margin of error is 5%,

the Confidence level is 95%. The calculated number was taken from second, third and fourth year female and male students according to their proportion.

Inclusion criteria: Second, third and fourth year female and male nursing students studying at King Abdulaziz University.

Instrumentation/data collection method: Two sets of tools are used in this study:

Tool I: Awareness of Nursing Students Regarding Vitamin B12 Deficiency Anemia questionnaire sheet:

This tool includes two sections: demographic data such as; age, gender, nationality and educational level. Section 2 is nursing students 'awareness regarding vitamin B12 deficiency. It used to obtain demographic information about the participant in the research and to measure the nursing students 'awareness regarding vitamin B12 deficiency anemia It has been adopted from (**AlMufarej et al., 2019**) and modified. In system score less than 60% it is considered unsatisfactory level of awareness, 60% and above it is considered as satisfactory level of awareness.

Tool II: The knowledge assessment questionnaire tool sheet:

This tool includes one sections: nursing students 'knowledge regarding to vitamin B12 deficiency anemia uses multiple choice questions. It used to measure the nursing students 'knowledge of vitamin B12deficiency anemia. It has been developed by researchers after reviewing the most recent literatures. Scores less than 60% it is considered as unsatisfactory level of knowledge, 60% and above it is considered as satisfactory level of knowledge.

4. Data analysis:

Data entry and analysis performed using the latest version of the Statistical Package for the Social Sciences (SPSS version 21). Descriptive statistics calculated to describe the study variables including frequencies, mean, standard deviation, range, and percentages.

Field work:

The tool used in this Questionnaire have been tested for the reliability and validity. Data collected through an electronic link The link be shared on what's app. The participants will receive an invitation to take part in the research as well. Before the questionnaire is filled out, an electronic informed consent will be obtained Anonymous involvement is entirely voluntary. The anonymized data will be protected, and its usage will be limited to the goals of this investigation.

Ethical considerations:

Ethical approval obtained from the faculty of Nursing at King Abdulaziz University, Jeddah, Saudi Arabia. Participants informed that participation is entirely voluntary, and they have the right to withdraw at any time they want. Ethical principles include the protection of privacy and confidentiality considered in this study. NREC Serial No.: Ref No2B.66.

Results:

Table 1 demonstrates that the majority of nursing students (78.9%) belonged to the age range of 21 to 23. (92.7 %) of the nursing

students were Saudi nationals. Additionally, (94%) of the nursing students were single. (36%) of the participants were third-year nursing students. Also half of nursing students (52.2%) belonged to the female category.

Table (2) shows that all items that be aware from the study sample and shows that the highest percentage of awareness (79.7%) was regarding (Do you want more information on vitamin B12 deficiency). While the lowest awareness (61.6%) was regarding (Have you ever gone for your vitamin B12 estimation).

Table (3) shows that the items of unawareness of study participants. The highest level of unawareness (38.4) %was regarding Have you ever gone for your vitamin B12 estimation. The lowest level of unawareness (20.3%) was regarding Do you want more information on vitamin B12 deficiency. The mean average of all correct answers is (67.92% > 60%), so the awareness of participants regarding vitamin B12 is **satisfactory.**

The table shows that (127), (54.7%) is correct; the best defines vitamin B12 deficiency anemia is Anemia caused by **inadequate absorption of vitamin B12, leading to reduced production of red blood cells**, and (74), (31.9%) is correct regarding Vitamin B12 deficiency anemia is primarily caused by **Impaired absorption of vitamin B12**, and (141), (60.8%) is correct regarding the primary treatment for **vitamin B12 deficiency anemia is Vitamin B12 injections or oral supplements**. Also (43.1), (43.1%) is correct regarding Pernicious anemia is a condition characterized by the **inability to absorb vitamin B12.**The table shows that (83), (35.8%) is correct; regarding primary dietary sources of vitamin B12 is **Dairy products**, and (106) (45.7%) is correct regarding the primary role of vitamin B12 in the body is **red blood cell formation**, and (57), (24.6%) is correct regarding the higher risk of developing vitamin B12 deficiency anemia is **older adults**, and (138), (59.5%) is correct regarding the most accurate diagnostic test for vitamin B12 deficiency is **Serum vitamin B12 level**.

The table shows that (115), (49.6%) is correct regarding Untreated vitamin B12 deficiency anemia can lead to **Neurological damage**, and (93), (40.1%) is correct regarding the neurological symptoms associated with severe vitamin B12 deficiency can include **Numbness and tingling in the extremities**, and (70), (30.2%) is correct regarding the following symptoms are NOT commonly associated with vitamin B12 deficiency anemia is **Jaundice**, and (83), (35.8%) is correct regarding the symptoms of both iron deficiency anemia and vitamin B12 deficiency anemia: **Fatigue, Rapid heartbeat, and Shortness of breath.**

Conditions can lead to impaired absorption of vitamin B12shows that (72), (31%) is correct; the conditions are **Crohn's disease** and the absorption of vitamin B12 primarily occurs shows that (96), (41.4%) is correct regarding the **small intestine**. Also the common cause of impaired absorption of vitamin B12 shows that (56), (24.1%) is correct regarding the common cause is **Gastric bypass surgery**.in addiction the presence of intrinsic factors is necessary for the absorption of vitamin B12 in shows that (99), (42.7%) is correct regarding the **Small intestine** and the production of intrinsic factors, necessary for vitamin B12 absorption, occurs in shows that (39), (16.8%) is correct regarding **stomach**.

Table (8) shows that (98), (42.2%) is correct regarding **Macrocytic anemia** and the table of the populations that may require higher vitamin B12 intake are shows that (90), (38.8%) is correct regarding **Vegetarians, liver, and smokers**. Also, the table of the organ that stores vitamin B12 in the body is shows that (66), (28.4%) is correct regarding **Liver**. In addition, the table of the formation of red blood cells is dependent on shows that (121), (52.2%) is correct regarding **Vitamin B12**..The mean average of all correct answers is (39% < 60%), so the knowledge is **not satisfactory.**

Table 1. Participants Demographic Characteristics: (232)

Demographic Variables	Frequency	Percentage
Age		
18-20 years	183	78.9
21-23 years	44	19.0
24 years and above	5	2.2
Education level		
Fourth-year	69	29.7
Third-year	85	36.6
Second-year	78	33.6
Gender		
Female	121	52.2
Male	111	47.8
Marital Status		
Single	218	94.0
Married	13	5.6
Widowed	1	.4
Nationality		
Saudi	215	92.7
Non- Saudi	17	7.3

Table 2. Frequency and Percentage distribution of The Awareness of participants regarding vitamin B12 deficiency anemia: (232)

Items:	Responses	Frequency	Percent
Have you ever gone for your hemoglobin level estimation	**Yes**	155	66.8
Do you know the normal range of hemoglobin concentration	**Yes**	152	65.5
Have you ever gone for your vitamin B12 estimation	**Yes**	143	61.6
Have you ever heard about vitamin B12	**Yes**	171	73.7
Do you know the importance of vitamin B12 intake to the body	**Yes**	166	71.6
Do you know the symptoms and signs of vitamin B12 deficiency	**Yes**	156	67.2
Do you know the food sources for vitamin B12	**Yes**	152	65.5
Do you know the complications of vitamin B12 deficiency	**Yes**	148	63.8
Do you know how to prevent vitamin B12 deficiency	**Yes**	148	63.8
Do you want more information on vitamin B12 deficiency	**Yes**	185	79.7

Table 3. Frequency and Percent distribution of unawareness of nursing students regarding vitamin B12 deficiency anemia: (232)

Items:	Responses	Frequency	Percent
Have you ever gone for your hemoglobin level estimation	**No**	77	33.2
Do you know the normal range of hemoglobin concentration	**No**	80	34.5
Have you ever gone for your vitamin B12 estimation	**No**	89	38.4
Have you ever heard about vitamin B12	**No**	61	26.3
Do you know the importance of vitamin B12 intake to the body	**No**	66	28.4
Do you know the symptoms and signs of vitamin B12 deficiency	**No**	76	32.8
Do you know the food sources for vitamin B12	**No**	80	34.5
Do you know the complications of vitamin B12 deficiency	**No**	84	36.2
Do you know how to prevent vitamin B12 deficiency	**No**	84	36.2
Do you want more information on vitamin B12 deficiency	**No**	47	20.3

Table.4 Frequency and Percent distribution of satisfactory knowledge regarding definition , cause ,treatment of vitamin B12 deficiency anemia and definition of pernicious anemia: (232)

Items:		**Frequency**	**Percent**
Which of the following best defines vitamin B12 deficiency anemia	Anemia caused by inadequate absorption of vitamin B12, leading to reduced production of red blood cells.	127	54.7
	Anemia caused by a lack of iron in the diet.	32	13.8
	Anemia due to excessive consumption of vitamin B12.	23	9.9
	Anemia resulting from a deficiency of vitamin C.	50	21.6
	Total	232	100.0
Vitamin B12 deficiency anemia is primarily caused by	Impaired absorption of vitamin B12.	74	31.9
	Inadequate intake of vitamin B12-rich foods.	88	37.9
	Genetic mutation affecting red blood cell production.	28	12.1
	Excessive intake of vitamin B12-rich foods.	42	18.1
	Total	232	100.0
The primary treatment for vitamin B12 deficiency anemia is	Vitamin B12 injections or oral supplements.	141	60.8
	Iron supplements.	22	9.5
	Folic acid supplements.	45	19.4
	Blood transfusion.	24	10.3
	Total	232	100.0
Pernicious anemia is a condition characterized by	Inability to absorb vitamin B12.	100	43.1
	Excessive production of red blood cells.	27	11.6
	Inadequate production of red blood cells.	80	34.5
	Elevated levels of vitamin B12.	25	10.8
	Total	232	100.0

Table 5. Frequency and Percent distribution of satisfactory knowledge regarding Dietary source of vitamin B12 , risk of developing vitamin B12 deficiency anemia and the accurate diagnostic test: (232)

Items:		Frequency	Percent
Which of the following is a primary dietary source of vitamin B12	Dairy products.	83	35.8
	Grains.	30	12.9
	Vegetables.	83	35.8
	Fruits.	36	15.5
	Total	232	100.0
The primary role of vitamin B12 in the body is	Red blood cell formation.	106	45.7
	Immune system function.	35	15.1
	Energy production.	34	14.7
	Bone health.	57	24.6
	Total	232	100.0
Which of the following populations is at a higher risk of developing vitamin B12 deficiency anemia	Older adults.	57	24.6
	Pregnant women.	92	39.7
	Children.	42	18.1
	Athletes.	41	17.7
	Total	232	100.0
The most accurate diagnostic test for vitamin B12 deficiency is	Serum vitamin B12 level.	138	59.5
	Complete blood count (CBC).	29	12.5
	Genetic testing.	24	10.3
	Bone marrow biopsy.	41	17.7
	Total	232	100.0

Table.6 Frequency and Percent distribution of satisfactory knowledge regarding The symptoms and complications when not treated: (232)

Items:		Frequency	Percent
Untreated vitamin B12 deficiency anemia can lead to	Neurological damage.	115	49.6
	Osteoporosis.	53	22.8
	Diabetes mellitus	30	12.9
	Heart disease.	34	14.7
	Total	232	100.0
The neurological symptoms associated with severe vitamin B12 deficiency can include	Numbness and tingling in the extremities.	93	40.1
	Fatigue and weakness.	62	26.7
	Shortness of breath.	58	25.0
	Pale skin.	19	8.2
	Total	232	100.0
Which of the following symptoms is NOT commonly associated with vitamin B12 deficiency anemia	Jaundice.	70	30.2
	Easy bruising.	33	14.2
	Fatigue and weakness	57	24.6
	Pale skin	72	31.0
	Total	232	100.0
Which of the following is a symptom of both iron deficiency anemia and vitamin B12 deficiency anemia	Fatigue.	46	19.8
	Rapid heartbeat.	52	22.4
	Shortness of breath	51	22.0
	All of the above	83	35.8
	Total	232	100.0

Table.7 Frequency and Percent distribution of satisfactory knowledge regarding Absorption of vitamin B12 : (232)

Items:		Frequency	Percent
Which of the following conditions can lead to impaired absorption of vitamin B12	Crohn's disease.	72	31.0
	Hypothyroidism.	68	29.3
	Diabetes mellitus.	61	26.3
	Hypertension.	31	13.4
	Total	232	100.0
The absorption of vitamin B12 primarily occurs in the	Large intestine.	64	27.6
	Small intestine.	96	41.4
	Stomach.	35	15.1
	Liver.	37	15.9
	Total	232	100.0
A common cause of impaired absorption of vitamin B12 is	Gastric bypass surgery.	56	24.1
	Low intake of vitamin D.	90	38.8
	High intake of vitamin C.	52	22.4
	Sedentary lifestyle.	34	14.7
	Total	232	100.0
The production of intrinsic factor, necessary for vitamin B12 absorption, occurs in the	Kidneys.	25	10.8
	Pancreas.	48	20.7
	Stomach	39	16.8
	Small intestine	120	51.7
	Total	232	100.0
The presence of intrinsic factor is necessary for the absorption of vitamin B12 in the	Kidneys.	31	13.4
	Small intestine.	99	42.7
	Stomach.	37	15.9
	Liver.	65	28.0
	Total	232	100.0

Table 8. Frequency and Percent distribution of satisfactory knowledge regarding Production of vitamin B12: (232)

		Frequency	Percent
The condition characterized by enlarged red blood cells in vitamin B12 deficiency anemia is called	Macrocytic anemia.	98	42.2
	Microcytic anemia.	29	12.5
	Hemolytic anemia.	29	12.5
	Normocytic anemia..	76	32.8
	Total	232	100
Which of the following populations may require higher vitamin B12 intake	Vegetarians.	65	28
	Smokers.	24	10.3
	All of the above.	90	38.8
	Liver.	53	22.8
	Total	232	100
Which organ stores vitamin B12 in the body	Kidneys.	39	16.8
	Pancreas.	65	28
	Spleen.	62	26.7
	Liver.	66	28.4
	Total	232	100
The formation of red blood cells is dependent on	Vitamin B12.	121	52.2
	Vitamin D.	56	24.1
	Vitamin C.	23	9.9
	Vitamin B6.	32	13.8

Discussion:

This study aimed to assess the knowledge and awareness of nursing students at King Abdulaziz University regarding vitamin B12 deficiency anemia. The results revealed that while the participants demonstrated a satisfactory level of awareness about vitamin B12 deficiency, their knowledge was found to be unsatisfactory, with a mean average of correct answers below 60%.

Awareness of Vitamin B12 Deficiency:

The study findings indicated that the nursing students exhibited a satisfactory level of awareness regarding vitamin B12 deficiency, with a mean percentage of positive responses exceeding 60%. This result aligns with a previous study conducted by **AlMufarrej et al. (2019),** which evaluated the awareness of vitamin B12 importance and deficiency among the Saudi population. The authors reported a relatively high level of awareness, with 63.5% of participants acknowledging the importance of vitamin B12 intake for the body.

However, as highlighted by **Pawlak et al. (2014),** awareness alone does not necessarily translate into comprehensive knowledge or the ability to effectively manage vitamin B12 deficiency anemia in clinical practice. Awareness is merely the first step towards acquiring the requisite knowledge and skills to address this health issue.

Knowledge of Vitamin B12 Deficiency Anemia:

Despite the satisfactory level of awareness, the nursing students in this study demonstrated an unsatisfactory level of knowledge regarding vitamin B12 deficiency anemia, with a mean average of correct answers below 60%. This finding is consistent with previous studies that have highlighted knowledge gaps among nursing students and healthcare professionals concerning various aspects of vitamin B12 deficiency.

In a study conducted by **Ortet-Walker et al. (2019),** the authors found that patients' knowledge about their condition of vitamin B12 deficiency was very low, and nursing staff reported a lack of educational tools, resulting in inconsistent and potentially inaccurate information being provided to patients. This study underscores the importance of addressing knowledge deficits among healthcare professionals, including nursing students, to ensure effective patient education and management.

Similarly, a study by **Khalaf and Abu Madini (2019)** revealed a significant knowledge gap among nursing students regarding iron deficiency anemia, another form of nutritional deficiency anemia. The authors highlighted the need for targeted educational interventions to improve nursing students' knowledge and performance in this area, which is consistent with the recommendations made by **Jameson et al. (2018)** in their review of vitamin B12 deficiency management.

The unsatisfactory knowledge level observed in the present study may be attributed to several factors, including inadequate emphasis on nutritional aspects in the nursing curriculum or insufficient exposure to clinical scenarios involving vitamin B12 deficiency anemia during nursing training.

Causes and Risk Factors of Vitamin B12 Deficiency Anemia:

Understanding the causes and risk factors of vitamin B12 deficiency anemia is essential for its effective prevention, diagnosis, and management. The study results revealed some knowledge gaps in this area among the nursing students.

Approximately one-third (31.9%) of the participants correctly identified impaired absorption of vitamin B12 as the primary cause of vitamin B12 deficiency anemia. This finding aligns with the literature, which highlights conditions like pernicious anemia, gastric surgery, and inflammatory bowel diseases as common causes of impaired vitamin B12 absorption **(Ankar& Kumar, 2023; Dastidar& Sikder, 2022; Andrès et al., 2013).**

Additionally, while 37.9% of the participants recognized inadequate intake of vitamin B12-rich foods as a contributing factor, it is important to note that this is typically a less common cause in developed countries, where dietary sources of vitamin B12 are generally available **(Ankar& Kumar, 2023; Andrès et al., 2013).**

Regarding risk factors, only 24.6% of the participants correctly identified older adults as a high-risk population for developing vitamin B12 deficiency anemia. This finding aligns with previous research, which has reported a higher prevalence of vitamin B12 deficiency in older individuals due to factors such as decreased absorption, dietary insufficiency, and the use of certain medications **(Andrès et al., 2013; Wolffenbuttel et al., 2019).**

Furthermore, vegetarians and vegans, who exclude animal-derived products from their diets, are also at increased risk of vitamin B12 deficiency due to the lack of dietary sources **(Dastidar&Sikder, 2022; Ankar& Kumar, 2023; Pawlak et al., 2014).** However, only 28% of the participants correctly identified vegetarians as a population requiring higher vitamin B12 intake.

These knowledge gaps highlight the need for comprehensive education on the causes and risk factors of vitamin B12 deficiency anemia, as early identification of at-risk individuals is crucial for timely intervention and prevention of potential complications, as emphasized by **Andrès et al. (2013).**

Diagnosis and Management of Vitamin B12 Deficiency Anemia:

The study results revealed varying levels of knowledge among the nursing students regarding the diagnosis and management of vitamin B12 deficiency anemia.

Encouragingly, 59.5% of the participants correctly identified serum vitamin B12 level as the most accurate diagnostic test for vitamin B12 deficiency. This finding aligns with the recommended diagnostic approach, which involves measuring serum vitamin B12 levels, along with other potential tests such as methylmalonic acid and homocysteine levels,

depending on the clinical presentation **(Ankar& Kumar, 2023; Dastidar& Sikder, 2022; Andrès et al., 2013).**

Regarding treatment, 60.8% of the participants correctly recognized that vitamin B12 injections or oral supplements are the primary treatment modalities for vitamin B12 deficiency anemia. This knowledge is crucial, as prompt and appropriate treatment is essential to prevent or reverse the potential hematological and neurological complications associated with vitamin B12 deficiency **(Ankar& Kumar, 2023; Andrès et al., 2013; Wolffenbuttel et al., 2019).**

However, knowledge gaps were observed in other aspects of diagnosis and management. Only 42.2% of the participants correctly identified macrocytic anemia, characterized by enlarged red blood cells, as a condition associated with vitamin B12 deficiency anemia. This finding highlights the need for further education on the hematological manifestations of vitamin B12 deficiency, as recognizing these clinical features can aid in early diagnosis and intervention, as emphasized by **Andrès et al . .(2013)**

Additionally, only 31% of the participants correctly identified Crohn's disease as a condition that can lead to impaired absorption of vitamin B12. This knowledge gap is concerning, as inflammatory bowel diseases like Crohn's disease are known risk factors for vitamin B12 deficiency, and early recognition and management are crucial in these patient populations **(Ankar& Kumar, 2023; Dastidar& Sikder, 2022; Andrès et al., 2013).**

Furthermore, while the majority of participants recognized the potential neurological consequences of untreated vitamin B12 deficiency anemia, including neurological damage (49.6%), there were knowledge gaps regarding other potential complications. For instance, only 22.8% of the participants identified osteoporosis as a potential consequence, despite evidence suggesting that vitamin B12 deficiency may contribute to the development of osteoporosis and an increased risk of fractures **(Ankar& Kumar, 2023; Andrès et al., 2013; Wolffenbuttel et al., 2019).**

These findings underscore the need for comprehensive education on the diagnostic approaches, treatment modalities, and potential complications of vitamin B12 deficiency anemia, to ensure that nursing students are well-equipped to recognize, manage, and provide appropriate patient education regarding this condition, as emphasized by **Jameson et al. (2018) and Wolffenbuttel et al.(2019) .**

Role of Nurses in Vitamin B12 Deficiency Anemia Management:

Nurses play a crucial role in the management of vitamin B12 deficiency anemia, from screening and early identification to patient education and follow-up care. However, the knowledge gaps identified in this study highlight the need for targeted educational interventions to enhance the preparedness of nursing students in addressing this health issue effectively.

A study by **Saeed et al. (2020)** demonstrated the positive impact of nutrition education on the knowledge, attitudes, and practices of undergraduate nursing students. The authors reported significant improvements in the participants' understanding of various nutritional concepts, including vitamin deficiencies, after implementing a tailored educational program.

Similarly, **AlBuhairan et al. (2019)** found that targeted educational programs significantly improved nursing students' knowledge and awareness of nutritional issues, emphasizing the importance of incorporating such educational initiatives into nursing curricula, which is consistent with the recommendations made by **Jameson et al. (2018) and Wolffenbuttel et al.(2019) .**

Integrating comprehensive modules on vitamin B12 deficiency anemia, including its causes, risk factors, diagnostic approaches, treatment modalities, and potential complications, can enhance nursing students' preparedness to address this condition effectively. Additionally, incorporating case studies, simulations, and clinical experiences related to vitamin B12 deficiency anemia can further reinforce the practical application of knowledge and skills, as suggested by **Andrès et al.(2018) .**

Furthermore, fostering interdisciplinary collaboration and communication between nursing students and other healthcare professionals, such as physicians, dietitians, and pharmacists, can facilitate a comprehensive and coordinated approach to managing vitamin B12 deficiency anemia, as highlighted by **Wolffenbuttel et al. (2019) and Andrès et al . .(2013)**

Conclusion:

1. The level of awareness of nursing students at King Abdulaziz University regarding to Vitamin B deficiency anemia was (67.92%).
2. The level of knowledge of nursing students at King Abdulaziz University regarding to Vitamin B deficiency anemia was (39%).

Recommendations for Nursing Education and Practice

1-Updated and incorporate comprehensive modules on nutritional deficiencies, including vitamin B12 deficiency anemia. These modules should cover the etiology, risk factors, diagnostic approaches, treatment modalities, and potential complications associated with the condition. Additionally, case studies, simulations, and clinical experiences should be integrated to reinforce the practical application of knowledge and skills,

2-Continuing education programs and professional development opportunities should be made available to practicing nurses to enhance their knowledge and skills in managing vitamin B12 deficiency anemia. These programs should address the identified knowledge gaps and provide up-to-date information on the latest guidelines and best practices.

3-Interdisciplinary collaboration and communication should be encouraged among healthcare professionals, including nurses, physicians, dietitians, and pharmacists. This collaborative approach can facilitate a comprehensive understanding of vitamin B12 deficiency anemia and ensure coordinated care for patients.

4- Development and implementation of standardized educational materials and tools, such as patient information leaflets or multimedia resources, can support nurses in providing consistent and accurate information to patients regarding vitamin B12 deficiency anemia. These materials should be designed to address common misconceptions and reinforce key points about the condition, its management, and the importance of adherence to treatment recommendations,

5-Ongoing research and quality improvement initiatives should be conducted to evaluate the effectiveness of educational interventions and identify areas for further improvement in the management of vitamin B12 deficiency anemia within the nursing profession.

Limitations:

While this study provides valuable insights into the knowledge and awareness of nursing students regarding vitamin B12 deficiency anemia, it is important to acknowledge several limitations.

Firstly, the study was conducted at a single institution, King Abdulaziz University, which may limit the generalizability of the findings to nursing students at other universities or in different regions.

Secondly, the study relied on a self-reported questionnaire, which may be subject to response biases or inaccuracies. Future studies could incorporate objective assessments or practical evaluations to obtain a more comprehensive understanding of nursing students' knowledge and skills related to vitamin B12 deficiency anemia,

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