




## Iron deficiency anemia and its relationship with academic performance in university students

*Anemia ferropénica y su relación con el rendimiento académico en estudiantes universitarias*

Anemia ferropriva e sua relação com o desempenho acadêmico em estudantes universitários


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DOI (Genérico) : <https://doi.org/10.35622/j.rie.2021.01.011>  
DOI (Documento en español) : <https://doi.org/10.35622/j.rie.2021.01.011.es>  
DOI (Document in English) : <https://doi.org/10.35622/j.rie.2021.01.011.en>

Received 05/01/2020/ Accepted 15/03/2021 Published 30/03/2021

### ORIGINAL ARTICLE

#### KEYWORDS

Iron deficiency anemia, physiological, nutritional, academic performance

#### PALABRAS CLAVE

Anemia ferropénica, fisiológicos, nutricionales, rendimiento académico

**ABSTRACT.** The objective was to know the level of iron deficiency anemia and its relationship that it exerts on the low academic performance of the students of the Professional School of Medical Technology of the Andean University Néstor Cáceres Velásquez de Puno-Peru (2019). The research was quantitative and descriptive, correlational, cross-sectional. The sample consisted of 53 students (women), who were from the I, II, III, and IV semesters. To obtain data, the hemoglobin value of the students was determined, and a validated survey was applied to them to know their academic performance. The results showed that there are low percentages of students with iron deficiency anemia. The relationship, according to Spearman Rho, indicates that there is a moderate association between iron deficiency anemia and academic performance.

**RESUMEN.** El objetivo fue conocer el nivel de anemia ferropénica y su relación que ejerce sobre el bajo rendimiento académico de los estudiantes de la Escuela Profesional de Tecnología Médica de la Universidad Andina Néstor Cáceres Velásquez de Puno-Perú (2019). La investigación fue cuantitativa y descriptiva, correlacional, transversal. La muestra estuvo conformada por 53 estudiantes (mujeres), quienes fueron del I, II, III y IV semestre. Para la obtención de datos, se determinó el valor de hemoglobina a los estudiantes y se les aplicó una encuesta validada para conocer su desempeño académico. Los resultados mostraron que hay bajos porcentajes de estudiantes con

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anemia ferropénica. La relación, según Spearman Rho, indica que existe una asociación moderada entre la anemia por deficiencia de hierro y el rendimiento académico.

**PALAVRAS-CHAVE**

Anemia ferropénica, fisiológicos, nutricionales, rendimiento académico

**RESUMO.** O objetivo foi conhecer o nível de anemia ferropriva e sua relação com o baixo rendimento escolar dos alunos da Escola Profissional de Tecnologia Médica da Universidade Andina Néstor Cáceres Velásquez de Puno-Peru (2019). A pesquisa foi quantitativa e descritiva, correlacional, transversal. A amostra foi composta por 53 alunos (mulheres), que cursavam o I, II, III e IV semestres. Para a obtenção dos dados, foi determinado o valor de hemoglobina dos alunos e aplicado a eles uma pesquisa validada para conhecer seu desempenho acadêmico. Os resultados mostraram que há baixos percentuais de alunos com anemia ferropriva. A relação, segundo Spearman Rho, indica que existe uma associação moderada entre a anemia ferropriva e o desempenho acadêmico.

## 1. INTRODUCTION

At present, anemia is considered by the World Health Organization a public health problem and interferes with learning, cognitive development, and behavior (Armijos, 2009). Anemia is also considered to be the reduction in the normal number of circulating erythrocytes and the amount of hemoglobin in the blood (Taípe-Ruiz & Troncoso-Corso, 2019). It is known that anemia is one of the great public health problems worldwide, it is also known that iron deficiency anemia is a public health problem (Vila & Quintana, 2013).

Peru is no stranger to this disease and occurs in the most vulnerable populations where there is a situation of poverty and lack of access to basic health and education services, in addition anemia is considered a great problem for public health in America (Espinoza, Enríquez, & Villanueva, 2019). The impact of anemia is different according to the geographical area, it is higher in terms of economic cost in rural areas (Agudelo et al., 2003).

In Paraguay, nutrition is related to the condition of poverty and limited access to basic social services and vulnerable groups, who live in territories with a lower level of public investment (Alarcon et al., 2016). Although Latin America has made progress in the social and economic spheres in recent years, population groups still live in a situation of food insecurity and poverty, which are aggravated in the rural sector, affecting the most vulnerable population, children, women, and indigenous people. (Montalvo et al., 2019).

Nutritional interventions that are carried out before two years are crucial to ensure productivity, academic and social level, since almost all the delay in growth occurs during this period (Armijos, 2009). Supplementation programs have been effective under controlled conditions, however, there are technical and practical barriers: limited information on the effectiveness of supplementation interventions, side effects, poor adherence, and supply / distribution limitations. In some countries, geographic location, variations in language, and population size can make the cost of intervention programs through information, education, and communication programs very high. Another limitation is the low prioritization of the problem of anemia as it is a generally asymptomatic condition, where parents and health authorities are unable to become aware of the impact and consequences on children (Agudelo et al., 2003).

In Paraguay, the PANI program, the Comprehensive Nutritional Food Program of the Ministry of Public Health and Social Welfare - MSP and BS, is responsible for the prevention, assistance and control of malnutrition in children under five years of age and pregnant women who are in a situation of poverty, underweight or any situation of nutritional vulnerability, through health care at health posts and the delivery of the food supplement, consisting of milk enriched with iron, zinc, copper and vitamin C, however, It suffers from drawbacks such as the lack of budget availability or human resources, which makes it difficult to reach potential or at-risk communities (González et al., 2011). Our country is not alien to this reality because according to official figures, in Peru the proportion of children and adolescents with anemia was 43.5% in 2018, a situation that led the authorities to take actions to prevent the increase in these cases, they have also directly related the health status of children and adolescents with the level of academic performance in their respective study centers (Solano et al., 2020).

The UANCV students showed low academic performance rates, the teachers observed that the students lived with unsuitable lifestyles for their health, that is, they showed that they ate very little, had few hours of sleep due to work and study issues, and little physical activity. Faced with this reality, this research work aimed to determine the relationship between academic performance and iron deficiency anemia of students in the semesters.

## 2. METHOD AND MATERIALS

### Research method and type

This work is located under the hypothetical deductive method of quantitative approach, descriptive type, and cross-correlational design.

### Variables

**Iron deficiency anemia (Variable 1):** It was obtained through the blood sample in Vitrex microhematocrit tubes of 80 iu / ml from each student.

**Academic performance (Variable 2):** We worked with the average marks of the students expressed in the minutes of each semester.

### Sample

A sample of 53 students was taken (all were female) who attended the day of data collection. In it, the students of I, II, III and IV semester of the Professional School of Medical Technology of the Universidad Andina Néstor Cáceres Velásquez (UANCV) - Puno (Peru) participated in the academic period 2019. The students were previously sensitized to about the causes and consequences of having iron deficiency anemia, in addition to the importance of your participation in detecting and preventing it, the processing of the samples (taking a blood sample) was carried out in the laboratories of the Faculty of Health Sciences. The ages of the young students ranged from 17 to 26 years old.

### Statistical analysis test

The data of the two variables were processed through Spearman's rho correlation.

### 3. RESULTS

Table 1. Level of anemia adjusted to an altitude of 3,500 meters above sea level of students from I to IV semester of the E. P. of Medical Technology of the UANCV

LEVEL OF ANEMIA	AMOUNT	PERCENTAGE
SEVERE	3	6%
MODERATE	26	49%
MILD	14	26%
NO ANEMIA	10	19%
<b>TOTAL</b>	<b>53</b>	<b>100%</b>

**Source:** Questionnaire applied on the influence of iron deficiency anemia on the academic performance of the students at the Professional Medical Technology School of the UANCV, Puno – 2019

From table 1 we observe that 49% are students with moderate anemia, on the other hand, 6% have severe anemia, which were included in the study on the influence of iron deficiency anemia on the academic performance of the students at the Medical Technology Professional School.

Table 2. Relationship between iron deficiency anemia and academic performance in students from I to IV semester of the P.E. of Medical Technology of the UANCV

			Academic performance	Iron deficiency anemia
Rho de Spearman	Academic performance	Correlation coefficient	1,000	,248*
		Sig. (bilateral)	.	,017
		N	53	53
	Iron deficiency anemia	Correlation coefficient	,248*	1,000
		Sig. (bilateral)	,017	.
		N	53	53

\*. La correlación es significativa en el nivel 0,05 (bilateral).

**Source:** Questionnaire applied on the influence of iron deficiency anemia on the academic performance of the students of the Escuela Profesional Tecnología Médica and the minutes of the semesters that the students had taken.

The degree of correlation of iron deficiency anemia with academic performance is 0.248 with a significance value of 0.017. Which imply that iron deficiency anemia is associated with a minimal positive correlation with academic performance.

#### 4. DISCUSSION

The results indicate that the level of iron deficiency anemia in female adolescent students of the Universidad Andina Néstor Cáceres Velásquez is moderate. This result is similar to the conclusions of Espinoza-Henriquez et al. (2019), who carried out a study in university students with sleep and anxiety disorders, the same ones who presented moderate anemia and the results obtained by Ríos-Castillo et al. (1981), who determined the prevalence of anemia and iron nutrition status between 1981 and 2010 in Chilean women of childbearing age, having as results that the prevalence of anemia was moderate in all decades, without significant differences between decades, being 9, 6 and 10% for the periods 1981-1990, 1991-2000 and 2001-2010, respectively. On the other hand, the theoretical evidence indicates that at this age it is unlikely that young women will have severe anemia, since their body generates high levels of iron, it is also recognized that vitamin A, vitamin B2, vitamins B6, B12 and Folic Acid intervenes in the formation of red blood cells in the bone marrow, especially in adolescents. Vitamins A, C and Riboflavin favor the absorption of iron at the intestinal level, fulfilling a mobilizing role of the mineral from the reserves; while vitamins C and E have an antioxidant function for the protection of red blood cells (MINDIS, 2017).

The degrees of association between iron deficiency anemia with academic performance is low, but significant. This result is consistent with the investigations of Charqui and Sánchez (2018), who carried out an investigation with adolescents between 15 and 17 years old, to determine the level of anemia that the students have, and the marks obtained by the corresponding selected students were also requested. After the school year, according to the results obtained, 14% of the population presents moderate anemia, in terms of the evaluation of the students, 25% present low school performance. In the percentage of students with low academic performance, a higher percentage was observed in cases with anemia compared to healthy cases with a significance lower than 0.05, it was concluded that there is a statistically significant relationship between anemia and academic performance.

On the other hand, when interviewing the students about the reasons for their low academic performance, most of them indicate that, very apart from studying at the university, they work to be able to financially support the expenses that the study at a private university merits, therefore, they do not maintain quality of sleep or food. With this explanation, it is concluded that iron deficiency anemia is not an essential condition for low academic performance, but it does exert a negative influence on academic performance in university students.

Faced with the results presented, this research work suggests that other investigations prove whether extra-university work, poor quality of sleep and food influence or not the low academic performance of university students.

Among the limitations of this work is that male students were excluded; Since, initially, it had been thought that poor academic performance was due to menstruation, that is why we only worked with the female population, in addition to not being able to count on 100% of female students, especially the last semesters as they are no longer studying in University classrooms but in different health establishments.

## 5. CONCLUSIONS

The level of iron deficiency anemia adjusted to an altitude of 3500 masl of the students from I to IV semester of the professional school of Medical Technology of the Universidad Andina Néstor Cáceres Velásquez (Peru) presented on a moderate scale (49%).

The degree of relationship between iron deficiency anemia and academic performance is 0.248 with a p-value of 0.17, that is, it presents a low but significant relationship. It is explained that iron deficiency anemia is not a substantive condition for poor academic performance in young adolescents.

### **Agradecimientos / Acknowledgments:**

Expresamos el agradecimiento a los docentes de la Escuela Profesional de Tecnología Médica de la Facultad de Ciencias de la Salud de la Universidad Andina Néstor Cáceres Velásquez, Perú.

### **Conflicto de intereses / Competing interests:**

Los autores declaran que no incurrir en conflictos de intereses.

### **Rol de los autores / Authors Roles:**

Haydee Quispe: conceptualización, curación de datos, análisis formal, adquisición de fondos, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

Eveling Castillo: conceptualización, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

### **Fuentes de financiamiento / Funding:**

Los autores declaran que no recibieron un fondo específico para esta investigación.

### **Aspectos éticos / legales; Ethics / legals:**

Los autores declaran no haber incurrido en aspectos antiéticos, ni haber omitido aspectos legales en la realización de la investigación.

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