

Chapter 14 / Capítulo 14

*Screening, Diagnosis, and Prevention in Clinical Practice:
Evidence from Argentine and Latin American Medicine
(English Version)*

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Level of knowledge about hemolytic uremic syndrome among parents attending the Juan B Cairo health center in the town of Fray Luis Beltran (Santa Fe, Argentina), in 2025

Nivel de conocimiento sobre el síndrome urémico hemolítico en los padres que asisten al centro de salud Juan B Cairo de la localidad de Fray Luis Beltran (Santa Fe, Argentina), en el año 2025

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ABSTRACT

Introduction: hemolytic uremic syndrome (HUS) is a clinical disorder characterized by a triad of symptoms: non-immune-mediated hemolytic anemia, thrombocytopenia, and acute kidney injury. This syndrome is more common in children under 5 years of age and is frequently associated with *Escherichia coli* infections.

Objective: to describe the level of knowledge about HUS among parents attending the Juan B Cairo health center in the town of Fray Luis Beltran (Santa Fe, Argentina) in 2025.

Method: a quantitative, descriptive, observational, cross-sectional, prospective study was conducted. This study was carried out at the Juan B. Cairo Health Center. The study population consisted of all mothers, fathers, or caregivers responsible for preparing food for children between 6 months and 5 years of age. A survey with multiple-choice and dichotomous (yes/no) questions was conducted to investigate knowledge about HUS. The variables were analyzed using absolute and relative frequencies.

Results: a total of 60 surveys were analyzed; 48 (80 %) were from women and 12 (20 %) from men, with an average age of $27,85 \pm 5,39$ years. On average, 43 (72 %) of respondents said they had knowledge about HUS, the foods that transmit it, and its symptoms, learned from health professionals. In food hygiene and handling, 57 (95 %) knew when to wash their hands and utensils; 27 (45 %) did not recognize the term cross-contamination. Seventy-three percent of parents always washed their hands during food handling. All respondents cleaned surfaces and utensils and washed fruits and vegetables, although 40 % did not sanitize them. In addition, 30 (50 %) stored food correctly in the refrigerator and 39 (65 %) thawed meat properly. Fifty-three percent of parents had a high level of knowledge about SUH.

Conclusions: a high level of knowledge about HUS and food hygiene practices was found. Respondents reported knowing about the importance of proper food cleaning and handling; however, a lack of knowledge about cross-contamination and the lack of sanitization of fruits and vegetables was observed. Parents reported washing their hands at key moments during food preparation and following proper storage and cooking practices.

Keywords: Knowledge; Hemolytic Uremic Syndrome; Prevention; Hygiene; Hand Washing.

RESUMEN

Introducción: el síndrome urémico hemolítico (SUH) es un trastorno clínico caracterizado por una tríada de síntomas anemia hemolítica no inmunomediada, trombocitopenia y lesión renal aguda. Este síndrome es más común en niños menores de 5 años y se asocia frecuentemente con infecciones por *Escherichia coli*.

Objetivo: describir el nivel de conocimiento sobre el SUH en los padres que asisten al centro de salud Juan B Cairo de la localidad de Fray Luis Beltran (Santa Fe, Argentina), en el año 2025. **Materiales y métodos:** Se realizó un estudio de tipo cuantitativo, descriptivo, observacional de corte transversal, prospectivo. Este estudio, se llevó a cabo en el Centro de Salud de Salud Juan B. Cairo. La población estudiada estuvo conformada por la totalidad de madres, padres o cuidadores encargados de preparar alimentos a niños entre 6 meses y 5 años. Se realizó una encuesta con preguntas de opción múltiple y dicotómica (sí/no) que buscó indagar acerca de los conocimientos sobre el SHU. Las variables se analizaron a través de frecuencias absolutas y relativas porcentuales.

Resultados: se analizaron un total de 60 encuestas; 48 (80 %) eran de mujeres y 12 (20 %) de hombres, con una edad promedio de $27,85 \pm 5,39$ años. En promedio, 43 (72 %) de los encuestados dijeron tener conocimiento sobre el SUH, los alimentos que lo transmiten y sus síntomas, aprendido de profesionales de la salud. En higiene y manipulación de alimentos, 57 (95 %) conocían cuándo lavarse las manos y utensilios; 27 (45 %) no reconocían el término contaminación cruzada. El 73 % de los padres se lavaban las manos en todos los momentos de manipulación. Todos los encuestados limpiaban superficies y utensilios, y lavaban frutas y hortalizas, aunque 40 % no las sanitizaban. Además, 30 (50 %) ordenaban alimentos en la heladera correctamente y 39 (65 %) descongelaban carne de forma adecuada. El 53 % de los padres tenían un alto conocimiento sobre el SUH.

Conclusiones: se encontró un alto nivel de conocimiento SUH y las prácticas de higiene alimentaria. Los encuestados refirieron conocer sobre la importancia de la limpieza y manipulación adecuada de los alimentos; sin embargo, se observó desconocimiento sobre la contaminación cruzada y la falta de sanitización de frutas y hortalizas. Los padres manifestaron lavarse las manos en momentos clave durante la preparación de alimentos, y seguir prácticas adecuadas de almacenamiento y cocción.

Palabras clave: Conocimientos; Síndrome Urémico Hemolítico; Prevención; Higiene; Lavado De Manos.

INTRODUCTION

Hemolytic uremic syndrome (HUS) is a clinical disorder characterized by a triad of symptoms: non-immune-mediated hemolytic anemia, thrombocytopenia, and acute kidney injury (Viciconte & Otero, 2023). This syndrome is more common in children under 5 years of age. It is frequently associated with infections caused by Shiga toxin-producing *Escherichia coli* (STEC), especially serotype O157:H7, which is the main etiological agent in epidemic outbreaks in various regions, including Latin America (Argentine Ministry of Health, 2024).

In Latin America, reports on HUS incidence are limited. A study in Peru between 2015 and 2022 reveals that there were 228 hospitalizations for HUS in children under 14 years of age, with the most affected group being those under five years of age. The regions with the highest number of cases are Lima and Arequipa (Atamari-Anahui et al., 2023). Another specific study conducted at a pediatric hospital in Lima during 2010-2020 analyzed 83 cases and found that

86,8 % of patients had oligoanuria and 59 % required renal replacement therapy (Carrasco-Oros et al., 2023).

In Argentina, this disease is considered endemic, with approximately 400 to 500 new cases reported each year, with an incidence of 12,2 per 100 000 children under 5 years of age (Argentine Society of Pediatrics [SAP], 2024). This syndrome is the leading cause of acute renal failure and the second leading cause of chronic renal failure in children, accounting for 30 % of all kidney transplants in this population (Ortiz et al., 2002; Rivero et al., 2004).

Initial symptoms often include diarrhea, which can be bloody in up to 83,3 % of cases. Most patients present with pallor, edema, and anuria or oliguria during the acute phase of the disease; the prodromal period before the onset of HUS is approximately 4,5 days. Studies indicate that many cases occur in children from low-to middle-socioeconomic backgrounds and that most are eutrophic. This suggests that social and environmental factors may influence the prevalence of HUS (Rivas et al., 1998).

A study conducted at the N10 primary care center in Wilde, Avellaneda (Argentina) shows that 50 % of the mothers and fathers surveyed give foods susceptible to *E. coli* contamination to their children under 5 years of age. Preventive hygiene practices are inadequately implemented in households, and more than 60 % of those surveyed are unaware of HUS (Esquíroz, 2020).

Another study conducted among 30 parents or caregivers of children under 5 who attend two nutrition clinics in the city of Rosario, Santa Fe, found that 57 % of parents or caregivers have a high level of knowledge about SUH, and 87 % have a high level of knowledge about proper hygiene and food-handling practices. In terms of implementation, 73 % performed these practices correctly, and 80 % of parents and caregivers did not offer minced meat to children under 5 years of age (Lobártolo, 2022).

Therefore, health professionals must educate families about safe food handling and cooking practices, as well as the importance of handwashing (Ministry of Health of the Nation, 2013). Education about HUS is crucial for parents, as they contribute to the effective prevention of HUS in the pediatric population.

What is the level of knowledge about hemolytic uremic syndrome among parents who attend the Juan B Cairo health center in the town of Fray Luis Beltrán (Santa Fe, Argentina) in 2025?

Objective

To describe the level of knowledge about HUS among parents attending the Juan B Cairo health center in the town of Fray Luis Beltrán (Santa Fe, Argentina) in 2025.

METHOD

Design

The study was quantitative and observational, with a descriptive, cross-sectional, and prospective design. It lasted six months, from December 2024 to May 2025. Data collection took place from March 1 to May 1, 2025.

Scope

The study was conducted at the Juan B. Cairo Health Center, located at Pres. Juan Domingo Perón 501, Fray Luis Beltrán, Santa Fe, Argentina, which is a public, municipally administered

facility. The Juan B. Cairo Health Center offers medical consultations with general practitioners and clinicians, pediatric services, emergency medical services, a clinical analysis laboratory, and a pharmacy, among other services.

Population and Sample Selection Criteria

The unit of analysis was all mothers, fathers, or caregivers, of both sexes, over the age of 18, who accompanied children to the aforementioned health center during the second quarter of 2025, to whom the following selection criteria were applied:

Inclusion criteria

- Mother, father, or caregiver of children between 6 months and 5 years of age, responsible for preparing food, who agreed to participate in the study.

Exclusion criteria

- Mother, father, or caregivers who did not wish to participate in the study.

Elimination criteria

- Mother, father, or caregiver who did not complete the survey in its entirety.

Sampling and sample size

Sampling was non-probabilistic and convenience-based, with consecutive inclusion of all subjects.

Instruments

The data collection instrument used was the questionnaire designed by Lobártolo (2022). This was a mixed survey with multiple-choice and dichotomous (yes/no) questions that sought to investigate the knowledge of mothers, fathers, and caregivers about HUS (Appendix I). It should be noted that this survey was conducted in accordance with the Good Manufacturing Practices Manual developed by the Ministry of Social Development of the Province of Santa Fe, and the model questionnaire used for the Food Handler Course provided by ASSAL.

This survey was conducted in print format, self-administered, and guided by the student. To this end, the health center was visited on different days and at different times during the second quarter of 2025.

Definitions

- Knowledge about HUS: Information provided by the person about Hemolytic Uremic Syndrome.
- Food hygiene and handling practices: Information provided by the person about correct hygiene and handling practices.
- Care measures: Procedures carried out by individuals in food preparation.
- Level of knowledge: One point will be awarded for each question answered correctly, for a total of 21 points, which will be distributed across three levels of knowledge: Low (0 to 8 points), Medium (9 to 16 points), and High (17 to 21 points).

Statistical analysis

The collected data were entered into an Excel spreadsheet for processing in SPSS. Quantitative variables were analyzed using absolute and relative frequencies and summarized using measures of central tendency (mean, median, and mode) and measures of dispersion

(range and standard deviation). Qualitative variables were analyzed using absolute and relative frequencies. Based on these summaries, graphs were constructed using Excel, and tables were created for easy visualization.

Ethical considerations

The principles established in the Declaration of Helsinki and the Personal Data Protection Law (Law 25,326), applicable throughout the national territory, were respected, with the identity and data obtained reserved and the anonymity and confidentiality of mothers, fathers, and guardians ensured.

Authorization was obtained from the Health Center authorities to carry out the study.

RESULTS AND DISCUSSION

A total of 60 surveys were analyzed; of these, 48 (80 %) were from women and 12 (20 %) from men, with an average age of $27,85 \pm 5,39$ years (minimum: 19; maximum: 45). Table 2 shows the characteristics of the surveyed population, where it can be seen that 62 % had a secondary education level.

Table 1. Characteristics of the surveyed population		
Age	Absolute frequency	Relative frequency
18-30	48	80
31 - 40 years	10	17
41 - 50 years old	2	3
Gender		
Women	48	80
Male	12	20
Education		
Primary	13	22
Secondary	37	62
Tertiary/University	8	13
No education	2	3

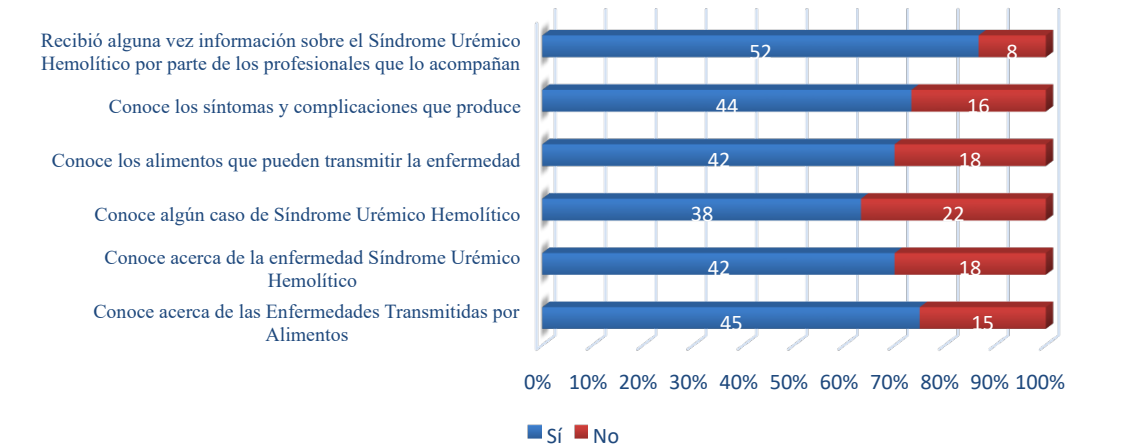


Figure 1. Knowledge of the emergency room reported by parents or guardians

On average, 43 (72 %) respondents reported knowledge of HUS, the foods that transmit it, and the symptoms and complications it causes, stating that they acquired this knowledge from health professionals. Figure 1 shows the distribution of responses obtained for variable knowledge about HUS.

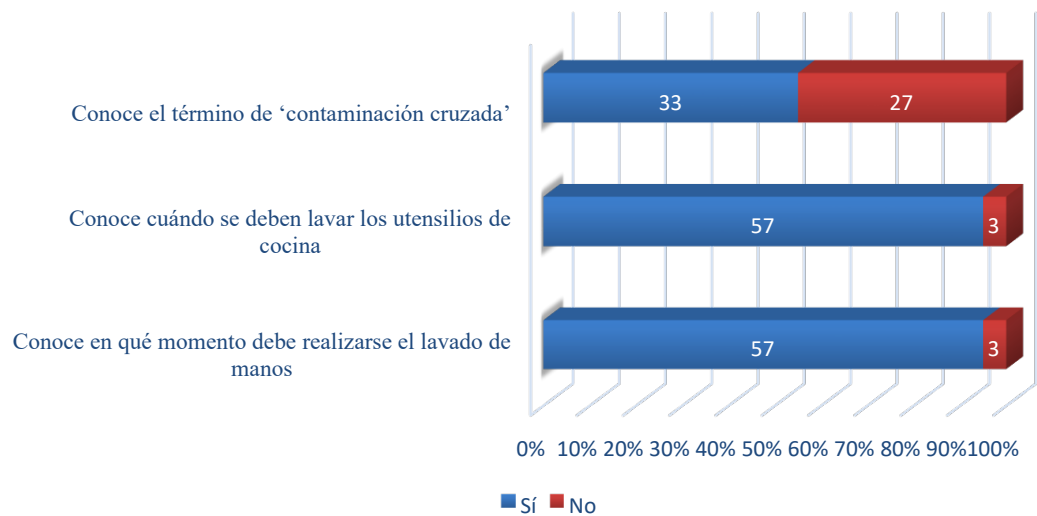


Figure 2. Knowledge about proper hygiene and food handling practices reported by parents or guardians

Regarding hygiene and food handling practices, 57 (95 %) respondents reported knowing when to wash their hands and kitchen utensils, respectively, and 27 (45 %) did not recognize the term cross-contamination (figure 2).

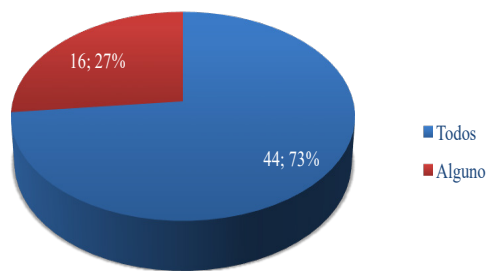


Figure 3. When to wash hands

Seventy-three percent of parents reported always washing their hands when handling food (before preparing meals, during meal preparation, after meal preparation, after using the bathroom, before feeding the child), and 27 % reported washing their hands at certain times (figure 3).

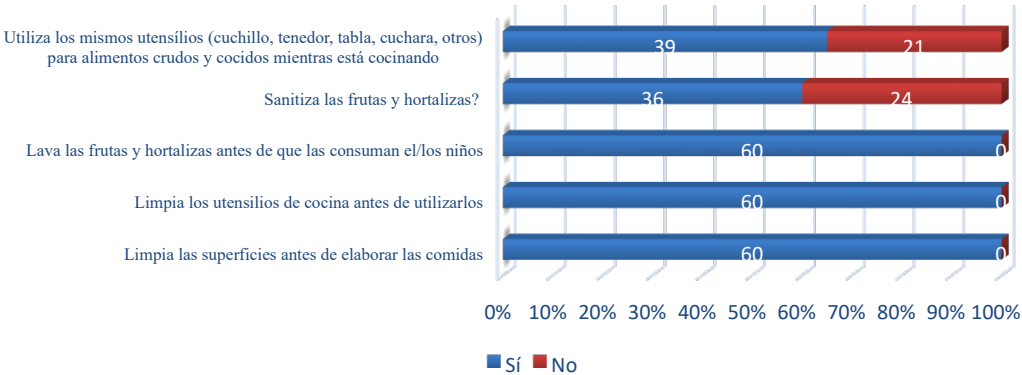


Figure 4. Care measures during food preparation reported by parents or guardians

Regarding care measures, 100 % of respondents reported cleaning kitchen surfaces and utensils before cooking, as well as washing fruits and vegetables before consumption. It was also found that 40 % do not sanitize fruits and vegetables, and 65 % use the same kitchen utensils to prepare raw and cooked foods (figure 4).

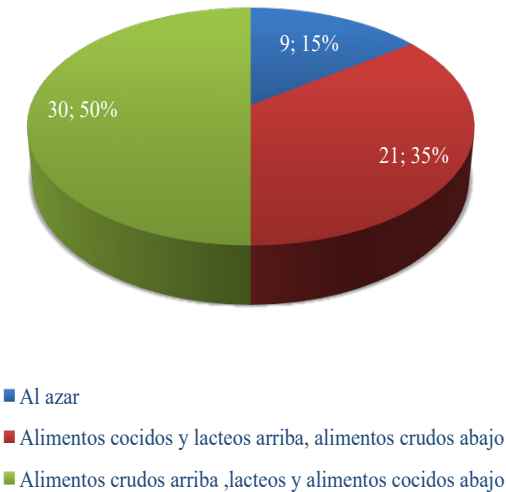


Figure 5. Order of food in the refrigerator as reported by parents or guardians

It was observed that 30 (50 %) respondents reported organizing food in the refrigerator by placing raw food on top and dairy and cooked food on the bottom (figure 5).

It was observed that 30 (50 %) respondents reported cooking meat properly until it is brown (figure 6).

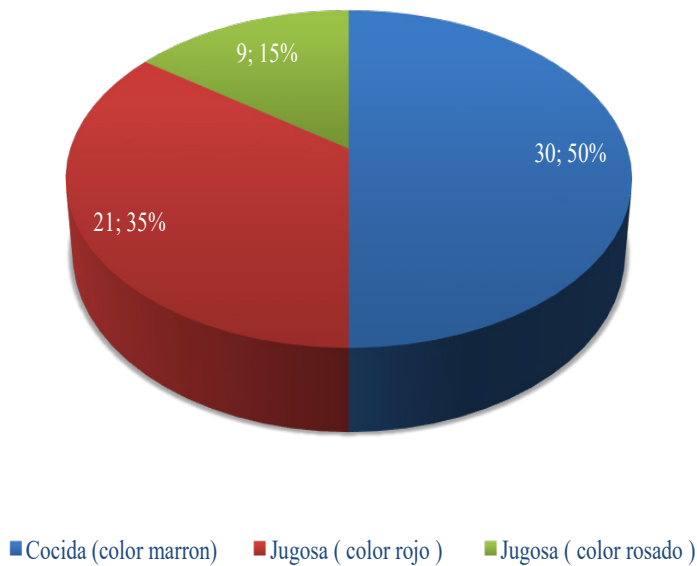


Figure 6. Cooking of meat as reported by parents or guardians

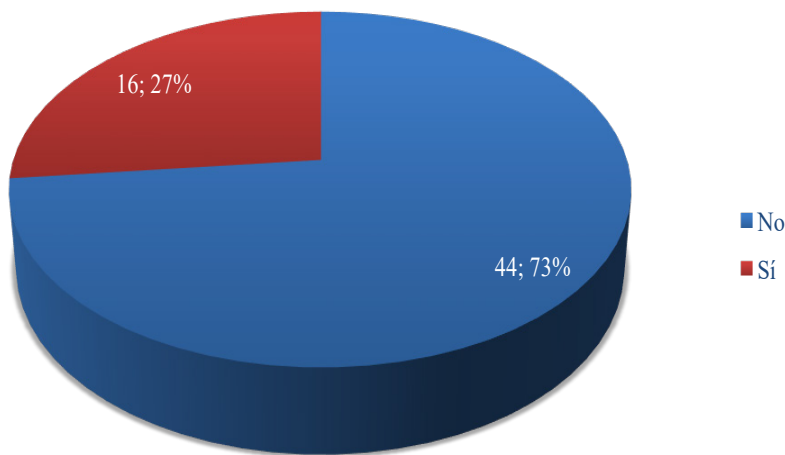


Figure 7. Preparation of minced meat for children

44 (73 %) respondents did not prepare minced meat for children under 5 years of age, as shown in figure 7.

Regarding meat thawing, 39 (65 %) respondents reported thawing in the microwave or refrigerator, and 21 (35 %) reported thawing at room temperature. 100 % (60) reported storing prepared food in the refrigerator and checking the expiration date of food.

Finally, 32 (53 %) of the parents or caregivers surveyed had a high level of knowledge about SUH, 22 (37 %) had an average level, and 6 (10 %) had a low level, as shown in figure 8.

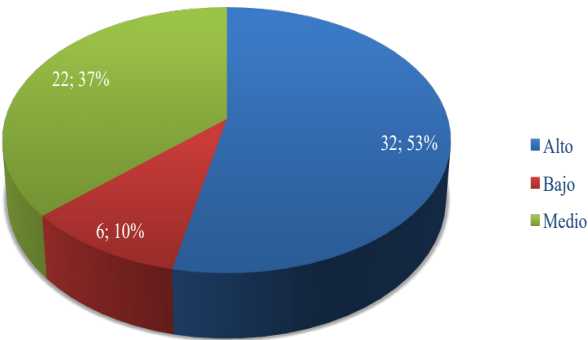


Figure 8. Level of knowledge

DISCUSSION

HUS is one of the main threats to children’s health in Argentina, with approximately 400 to 500 new cases reported annually, making it the leading cause of acute renal failure in pediatrics (National Food Protection Network [RENAPRA], 2015).

In terms of prevention, scientific evidence highlights that HUS is entirely preventable through good hygiene practices and safe food handling. However, recent studies show discrepancies in caregivers’ knowledge and application of these practices. For example, one study found that 65 % of mothers surveyed handled food improperly, and only 35 % did so correctly, with a direct impact on family health: 71 % of families reported episodes of gastrointestinal illness linked to these poor practices. Variations in hand washing were also notable, with only 41.6 % washing their hands properly at the start of food preparation. However, this figure increased to 81.69 % before eating, indicating significant hygiene issues that facilitate the transmission of pathogens associated with HUS (Velasquez, 2022).

In contrast, the present study reveals that the majority of the population surveyed reports good food hygiene practices, including handwashing at all times during food handling, cleaning surfaces and utensils, and properly washing fruits and vegetables before consumption. This coincides with another study by Lobártolo (2022), which showed that 87 % of mothers, fathers, or caregivers had a high level of knowledge about hygiene practices and that 73 % implemented them correctly, highlighting that 80 % avoided offering minced meat to children under 5 years of age, a key recommendation for preventing HUS.

The mothers surveyed have good knowledge of HUS mainly due to the high endemic incidence of this disease in the country, which has generated a strong need for education and prevention in the community. Argentina has the highest incidence of HUS in children under five years of age worldwide, which has prompted educational campaigns and specific intervention programs to inform parents, educators, and caregivers about preventive measures, such as hand washing and proper cooking of meat, which are the main ways to avoid infection by Shiga toxin-producing *Escherichia coli*, the cause of HUS (Bentancor, 2016; Mercado, 2007).

In addition, audiovisual educational interventions have been developed in pediatric hospitals, with a significant impact on caregivers’ knowledge of ways to prevent HUS, including mothers. These educational actions are crucial because HUS transmission occurs mainly through the consumption of contaminated food or water, or through contact with infected people or

animals. Education is essential for the community to internalize healthy, permanent behaviors.

On the other hand, research such as that by Ruiz et al. (2018) shows inadequate food-handling practices, including poor hygiene, poor handwashing and cutting board cleaning, incorrect reheating, and unsafe storage temperatures, which contrast with the more positive findings of the present study.

It is crucial to highlight the role of utensils in preventing HUS. Utensils that are difficult to clean, such as baby bottles, cups with straws, or plates with ridges, can promote bacterial proliferation, including Shiga toxin-producing *E. coli*, increasing the risk of gastrointestinal and respiratory infections. Therefore, it is recommended to avoid these utensils or to ensure they are thoroughly cleaned to minimize risk (Velasquez, 2022).

Similarly, the study by Lobártolo (2022) found that 57 % of mothers, fathers, or caregivers have a high level of knowledge about HUS, and 87 % have a high level of knowledge about proper hygiene and food handling practices. In terms of implementation, 73 % were found to be following these practices correctly, with 80 % of mothers, fathers, or caregivers not offering minced meat to children under 5 years of age, as was the case in the present study.

Scientific evidence shows that HUS can be completely prevented through good hygiene and food-handling practices. Therefore, educating mothers, fathers, and caregivers is a key public health strategy. However, the persistence of this common disease indicates major gaps in caregivers' knowledge and use of preventive measures.

Future interventions should focus on developing multi-causal educational strategies that include training health professionals, implementing public awareness campaigns, and establishing experiential workshops that provide both education and emotional support to families. Effective prevention of HUS requires a holistic approach that recognizes the educational, emotional, and social dimensions of this public health problem. Only through coordinated interventions that improve maternal knowledge and food hygiene practices will it be possible to reduce the incidence of this serious childhood disease significantly.

Limitations

As this is a single-center study, the results cannot be extrapolated to the actual level of knowledge about HUS among all parents or guardians of children under 5 years of age attending the various health centers in the city of Rosario.

The small sample size in the study limits the generalizability of the observations. Because the study used a self-administered survey, there was no verification of the collected data.

CONCLUSIONS

A high level of knowledge about SUH and food hygiene practices was found. Respondents reported knowing the importance of cleanliness and proper food handling; however, knowledge gaps regarding cross-contamination and the lack of sanitization of fruits and vegetables were observed. Parents reported washing their hands at key moments during food preparation and following proper storage and cooking practices.

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