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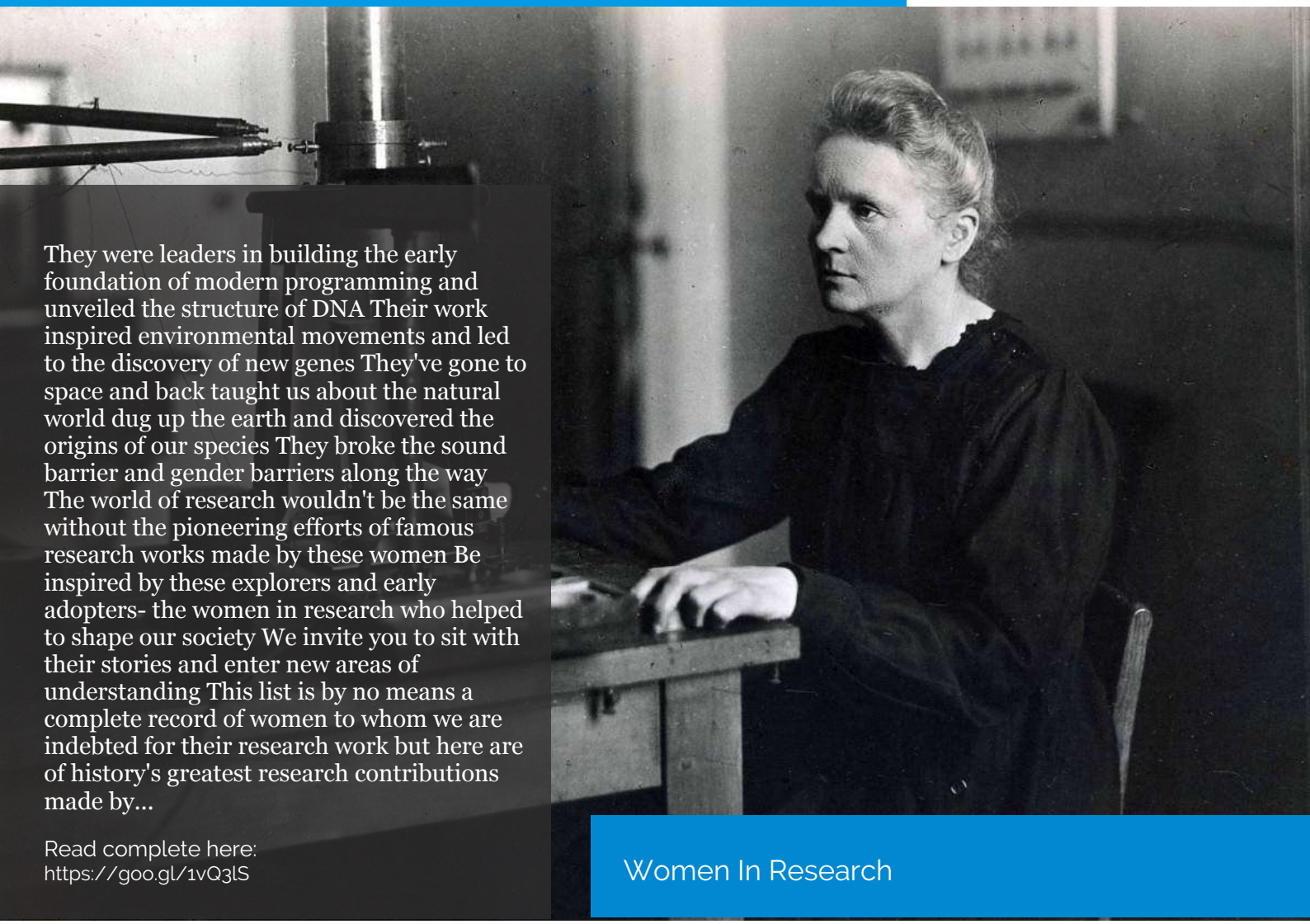

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Assessing Health-Related Quality of Life in Bolivian Hemodialysis Patients: Validation of the KDQOL-36™ Questionnaire

Alvaro Edgar Gutiérrez Avilés, René Soria Saucedo & Karol Dick Quiroz Gutiérrez*

ABSTRACT

Background: Chronic kidney disease (CKD) is a global health concern, affecting 2% of patients who may progress to end-stage renal disease (ESRD). Hemodialysis (HD) is the primary therapy, but it poses challenges, impacting patients' quality of life. In Bolivia, CKD prevalence is 40%, making it the fourth leading cause of death. Risk factors encompass restricted access to safe water, sanitation, and exposure to toxic chemicals, presenting notable public health challenges in Bolivia.. The aim of the study is to assess Health-Related Quality of Life (HRQOL) in Bolivian HD patients through the application and validation of the cross-culturally adapted Latin-Spanish version of the KDQOL-36™ questionnaire.

Keywords: Chronic kidney disease, health-related quality of life, hemodialysis, Bolivia, latin america, Cross-cultural adaptation, validation, patient outcomes, public health, renal replacement therapy.

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Alvaro Edgar Gutiérrez Avilés[α], René Soria Saucedo[σ] & Karol Dick Quiroz Gutiérrez[ρ]

ABSTRACT

Background: Chronic kidney disease (CKD) is a global health concern, affecting 2% of patients who may progress to end-stage renal disease (ESRD). Hemodialysis (HD) is the primary therapy, but it poses challenges, impacting patients' quality of life. In Bolivia, CKD prevalence is 40%, making it the fourth leading cause of death. Risk factors encompass restricted access to safe water, sanitation, and exposure to toxic chemicals, presenting notable public health challenges in Bolivia.. The aim of the study is to assess Health-Related Quality of Life (HRQOL) in Bolivian HD patients through the application and validation of the cross-culturally adapted Latin-Spanish version of the KDQOL-36™ questionnaire.

Methods: The cross-sectional study, approved by the Ethical Committee, involved 724 CKD patients undergoing HD in Bolivia's La Paz department. The sampling technique used proportional allocation based on registered patients in 23 HD units across three cities. Inclusion criteria comprised patients over 18 with at least two months of HD, capable of responding to the questionnaire. The cross-culturally adapted KDQOL-36™ survey, administered by trained healthcare staff, was assessed using SPSS for reliability, exploratory, and confirmatory factor analysis, ensuring validity and appropriateness for Bolivian patients. Data was collected between October and December 2023.

Results: The study included predominantly female participants (51.5%) with a mean age of 55.9 years and diverse educational backgrounds. HD was mainly received from the private health sector (65.7%), and the average duration was 31.4 months. Descriptive analysis of KDQOL-36™ scores showed variations across subscales, with symptoms and problems scoring highest (67.13, Min 10.42 Max 100) and the burden of kidney disease scoring lowest (24.61, Min 0 Max 100). Validity estimates, including McDonald's Omega (0.92), as well as exploratory and confirmatory factor analyses, were conducted.

Conclusions: The Latin-Spanish and cross-cultural adaptation version of the KDQOL-36™ questionnaire seems valid and reliable for assessing HRQOL in Bolivian patients with kidney disease undergoing HD. The sociocultural characteristics in the La Paz department may differ from those in other departments. Therefore, it is recommended to conduct this study in various Bolivian contexts. The utilization of this instrument is recommended for clinical research in Bolivia.

Keywords: Chronic kidney disease, health-related quality of life, hemodialysis, Bolivia, latin america, Cross-cultural adaptation, validation, patient outcomes, public health, renal replacement therapy.

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I. BACKGROUND

Chronic kidney disease (CKD) poses a substantial global health challenge. Recent research suggests that approximately 2% of CKD patients may eventually progress to end-stage renal disease (ESRD) (1). The preferred renal replacement therapy is hemodialysis (HD) (2), which can potentially improve patient survival rates. However, due to its limited efficacy and the significant time and effort involved, this treatment may give rise to noteworthy issues such as anemia, malnutrition, infections, and cardiovascular diseases, particularly among ESRD patients (3). Additionally, individuals undergoing HD also grapple with low employment rates, high economic burdens, limited social support, and psychological distress, all of which significantly impact their quality of life (4).

In Bolivia, the prevalence of CKD stage 3 was 40% by 2017, as reported by the Global Burden of Disease Project, making it the fourth most common cause of death in the country (5). This prevalence escalates rapidly in other low- and middle-income countries (6,7). CKD poses a significant public health challenge in Bolivia, with an estimated impact on approximately 10% of the population. CKD is characterized by the gradual and progressive loss of kidney function, often leading to the necessity for dialysis or kidney transplantation.

The roots of CKD in Bolivia trace back to the 1980s, marked by the initial reports of chronic renal failure cases in the Chimoré region within the Cochabamba department. These cases were attributed to exposure to pesticides and other chemicals utilized in cocaine production (8).

Subsequently, CKD has evolved into a major health concern across the entire country, particularly affecting rural and impoverished areas. The age-standardized mortality rate stands at 571.5 per 100,000 population, with about 35.26% of NCD-related deaths occurring prematurely. The probability of mortality between ages 30 and 70 due to cardiovascular disease, cancer, diabetes, or chronic respiratory diseases is 17.88 for both sexes, indicating a heightened risk compared to the Americas (9). Critical risk factors for CKD in Bolivia include limited access to safe drinking water, basic sanitation, and exposure to toxic chemicals. Furthermore, the prevalence of chronic conditions like diabetes and hypertension also contributes significantly to the CKD burden in Bolivia. Challenges such as inadequate access to quality healthcare and a lack of awareness regarding CKD risk factors represent major obstacles for the country in effectively preventing and managing this disease. Currently, Bolivia is in the process of updating national care standards with a focus on a comprehensive approach to CKD. This includes measures for both promotion and prevention, alongside initiatives to enhance healthcare personnel training and improve the availability of HD services in remote areas of the country.

In 2019, approximately 4,400 patients underwent renal replacement therapy, with 2,780 individuals receiving free HD, as reported by the National Renal Health Program of the Ministry of Health and Sports. This initiative was supported by the National Government.. To support this initiative, the government allocates 110,000 bolivianos annually for the care of each patient, resulting in a total disbursement exceeding 300 million bolivianos for all beneficiaries. This translates to an annual disbursement exceeding 43 million US dollars. (10). The highest number of individuals undergoing HD therapy were residing in La Paz city (45%). This data may reflect a higher patient registration, considering it is the second most densely populated department in Bolivia.

Health-related quality of life (HRQOL) refers to a person's perception of their health status and how it affects their physical, emotional, and social well-being. HRQOL assessment serves multiple objectives, including enhancing comprehension of the patient's disease experience, aiding health professionals in evaluating treatment effectiveness, and furnishing valuable data for medical care and public health policy decision-making. Monitoring HRQOL at different stages of CKD is recommended by nephrology societies (10), Furthermore, improving medical care for CKD patients on HD includes the crucial aspect of evaluating their HRQOL (11). Additional

information on the impact of CKD on HRQOL in the Bolivian context needs to be studied.

Various instruments are available to assess HRQOL, and one noteworthy tool is the Kidney Disease Quality of Life Questionnaire (KDQOL -36™). This questionnaire has undergone cross-cultural adaptation in several Spanish - speaking countries, demonstrating reliable psychometric characteristics (12–15). However, it is essential to note that the National Renal Health Program of the Bolivian Ministry of Health and Sports currently lacks any validated questionnaire. Research efforts are required to create or modify instruments that consider the Bolivian cultural context. This may entail collaborations with international organizations, research institutions, or healthcare professionals with expertise in nephrology and public health.

The history of the KDQOL-36™ dates back to the 1990s, when the KDQOL-SF questionnaire was developed by Tufts University in collaboration with the ERC Foundation and Duke University.

This questionnaire consisted of 134 questions and evaluated the health-related quality of life in patients with CKD. Due to the length of this questionnaire, it was decided to create a shorter and simplified version, which gave rise to the KDQOL-36™. The KDQOL-36™ survey, introduced in 2002, is a 36-item measure designed to assess Health-Related Quality of Life (HRQOL) in individuals with kidney disease. The initial version incorporated the Medical Outcomes Study 36 (MOS SF-36) as a generic chronic disease core, supplemented with items tailored to patients with kidney-related issues. These additional items cover symptoms, burden of illness, social interaction, staff encouragement, and patient satisfaction (16).

The 36 items are distributed across five subscales as follows: SF-12 Measure of Physical and Mental Functioning Subscales (1-5, 8 and 6-7, 9-12 respectively): Includes items on general health, activity limits, ability to accomplish desired tasks, depression, anxiety, energy level, and social activities with Likert-type response options of 3 or 5 points. Burden of Kidney Disease Subscale (14-17): Addresses the impact of kidney disease on daily life, considering factors like interference with daily activities, time consumption, frustration, and feelings of burden.

Symptoms and Problems Subscale (17-28b): Encompasses items evaluating the extent of bother related to various symptoms, including sore muscles, chest pain, cramps, itchy or dry skin, shortness of breath, faintness/dizziness, lack of appetite, feeling washed out, numbness in hands or feet, nausea, and issues with dialysis access. Effects of Kidney Disease on Daily Life Subscale (29-36): Examines the impact of kidney disease on daily life, gauging bother levels regarding fluid limits, diet restrictions, ability to perform household tasks or travel, dependence on medical professionals, stress or worries, sexual well-being, and personal appearance.The KDQOL -36™ has proven to be a valuable tool for assessing HRQOL in CKD patients and has been used in numerous clinical and epidemiological studies worldwide. In addition, it has been utilized and translated into multiple languages, consistently exhibiting good validity and reliability (13,15,17–32).

In this study, we utilized the Latin-Spanish and cross-cultural adaptation version of the KDQOL-36™. Chaves, Duarte, and Vesga carried out the cross-cultural adaptation of the Spanish version of the KDQOL-36™ instrument available on the RAND Health Care website, which is provided as a courtesy, and may not be free from errors (33). The instrument contains items that necessitate cross-cultural adaptations to enhance patient response.

The process of cross-cultural adaptation to Spanish spoken in Colombia, which is very similar to that spoken in Bolivia in general, significantly modified two items. In question 3, item b, "Moderate efforts, such as moving a table, vacuuming, playing bowling, or walking for more than 1 hour", was changed to "Moderate efforts, such as moving a table, vacuuming, or walking for more than 1 hour." This modification aimed to eliminate "playing bowling" from the item since, in both Colombia and Bolivia, it is a sporadically practiced sport and not widely popular, which

could impede understanding. Additionally, the original version mentions "playing golf" within the item, which is a less popular sport than bowling in Colombia and Bolivia. Therefore, this aspect was excluded from the item. Other modifications to the instrument include adjusting grammatical syntax and replacing words with more commonly used expressions in Colombian Spanish. The time required to fill out this questionnaire can be managed during HD sessions. Furthermore, the absence of cut-off points in the adapted versions' final results scale compels researchers to interpret the quality of life based on scores exceeding 50.

To date, no questionnaire that assesses explicitly the HRQOL of patients with CKD has been validated in Bolivia. This study aimed to evaluate the reliability and validity of the Latin-Spanish and cross-cultural adaptation version of the KDQOL-36™ among HD patients in Bolivia.

II. METHODS

The study received approval from the Ethical and Bioethical Committee of Faculty of Medicine, Nursing, Nutrition, and Medical Technology at Major University of San Andrés. (approval: COMETICA- RESOLUCIÓN Nro.02/2023 August 18, 2023). The confidentiality of the collected information was ensured by assigning anonymous codes to participants. Additionally, secure data management practices were implemented, involving storage on servers with restricted access. Participant confidentiality was maintained at every stage, from data collection to analysis, ensuring that only the research team had access to identifiable data. The KDQOL-36™ questionnaire was accompanied by an informative sheet outlining the study's objectives and the nature of the questionnaire. This sheet was presented to each participant, who subsequently signed the informed consent form. The participants were informed that their participation was voluntary and that they could withdraw at any stage.

3.1 Sampling and Data Collection Method

The cross-sectional study surveyed seven hundred twenty-four patients with CKD undergoing HD (excluding peritoneal dialysis) in the HD units registered in the National Renal Health Program of the Ministry of Health and Sports of Bolivia, specifically in the Department of La Paz. The sample size considered at least 20 participants for each item of the KDQOL-36™ instrument (34,35). The sampling frame for the La Paz department was 1.003 patients. The sampling technique used was proportional allocation based on the number of registered patients in each of the twenty-three HD units exclusively located in the three cities providing this service within the La Paz department (La Paz, El Alto, and Viacha), the information provided by the National Renal Health Program. The HD units belong to the public sector, short-term social security, or the private sector under an agreement with the Ministry of Health and Sports of the Bolivian health system. Inclusion criteria included patients over 18 years old with at least two months of renal replacement therapy through HD, capable of responding to the questionnaire. Exclusion criteria included patients with a positive diagnosis of COVID-19 and those with any mental illness or incapacity to respond to the questionnaire.

The health student volunteers underwent three training sessions conducted by the principal investigators. The training covered aspects such as biosafety in HD rooms, the protocol for reading the informative sheet to obtain informed consent, and time management for completing the questionnaire. Sessions were scheduled outside working hours due to the volunteers' daily activities.. Confidentiality of data was ensured before collecting information. Data was collected between October and December 2023. The period taken to reach the estimated sample size was determined once the ethics committee authorization was obtained.

3.2 Survey Instrument

Participants were surveyed by voluntary healthcare staff using the cross-culturally adapted Latin-Spanish version of the KDQOL-36™ and a sociodemographic questionnaire. This questionnaire was devised by the authors and encompassed variables associated with patients' backgrounds, including gender, age, educational attainment, employment status, and the duration

of HD. The survey was accessible in an Android version generated through the open-source, scalable, and remotely manageable software KoboToolBox and KoboCollect. This software automatically created the database, and real-time remote supervision and data quality control were conducted, offering assistance to volunteers when requested via phone. The scores for the five subscales of the KDQOL-36™ questionnaire were calculated using a Microsoft Excel scoring tool developed by the instrument's working team, accessible through the RANDHealthCare@ rand.org portal, with scores ranging from 0 to 100. The KDQOL-36™ scoring program (v1.0) is an Excel 97 spreadsheet with five sheets: RAW, CONVERT, SCORE, SCALE, and STATS. It allows data entry for up to 1000 cases, handling more with slight adjustments. The RAW sheet includes case details and KDQOL-36™ items with validation rules. CONVERT lists item rescores, and SCORE is an intermediate table. SCALE computes scale scores, while STATS provides descriptive statistics for KDQOL and SF-12 composite scores across all patients.

3.3 Statistical Analysis

The analysis was conducted using the SPSS 26.0.0.0 (IBM PASW, USA).

The reliability analysis involved calculating the McDonald's Omega index for both the overall scale and individual subscales (36), along with determining the mean and standard deviation for each. The McDonald's omega coefficient is applied when the response scale is ordinal and is considered more suitable than Cronbach's alpha when a questionnaire has interval scales and also when there are fewer than four response options on the Likert scale. The principal component method was utilized in an exploratory factor analysis EFA to condense dimensions based on the five theoretical domains of the instrument (latent variables). A deductive approach was implemented to propose the existence of specific dimensions and evaluate the unity of the obtained data with the previously suggested factorial structure. For the ultimate solution, eigenvalues surpassing one were acquired to illustrate the number of factors elucidating over 50% of the total variability. Varimax rotation with Kaiser normalization (orthogonal quadrant rotation) was executed, consolidating items within each distinct theoretical factor. (37). Additionally, a Confirmatory Factor Analysis (CFA) was conducted to obtain a well-adjusted factor structure for the data. The CFA was performed on the most appropriate variance-covariance matrix using the IBM SPSS Amos 26.0 statistical package. The Maximum Likelihood estimation method was employed. To achieve model identification, regression coefficients of error terms on endogenous variables were fixed at 1. Initially, two models were analyzed, varying in the number of items and latent factors: (1) 36 items and five latent factors; (2) 31 items and five factors – this model corresponds to the best 31 items selected after the EFA, excluding four items. In both individual and global models, each item was uniquely associated with its respective factor.

IV. RESULTS

4.1 Characteristics of the Study Subjects

More than half of the study participants were female (51.5%), with a mean age of 55.9 years. 43.6% of the participants had primary-level education. Most of them were married (60.1%) and received HD in the private sector of the health system (65.7%). The average duration of HDs among the study participants was 31.4 months, and the majority were employed in unskilled occupations (30.1%). For details, refer to Table 1.

4.2 Descriptive Analysis of the KDQOL-36 Scale

The mean scores for each subscale of the KDQOL-36™ varied between 24.61 and 67.13. Symptoms and problems related to kidney disease achieved the highest mean score (67.13 ± 17.82), whereas the Burden of kidney disease exhibited the lowest mean score (24.61 ± 18.80). Descriptive statistics for the KDQOL-36™ are presented in Table 2.

4.3 Validity Estimate: McDonald's Omega

The McDonald's Omega for each KDQOL-36™ subscale ranged from .704 to .855. The Kidney Disease Effects subscale achieved the highest Omega (.922 and .926 with standardized results),

while the Physical Component subscale had the lowest Omega (.704 and .792 with standardized results). The McDonald's Omega for the entire instrument was .922 with all 36 items (.926 with standardized results). To consider an acceptable reliability value using the omega coefficient, it should fall between .70 and .90, although in some circumstances, values higher than .65 may be acceptable (37). The results of McDonald's Omega and its standardized results are described in Table 2.

4.4 Construct Validity: Exploratory Factor Analysis

The exploratory factor analysis, employing the principal component extraction method and varimax rotation of KDQOL-36™ items, revealed their identification of the five subscales (latent variables) proposed by the instrument's developers. Individualized EFA facilitated the recognition of the five latent variables. The items were chosen in a way that allowed the analysis to identify a single known latent variable a priori. However, the renal disease symptoms/problems subscale adjusted to a single factor by excluding only item 20, "Is your skin itchy?" from the individual EFA. The final solution, with eigenvalues greater than 1, signifies five factors explaining 52.17% of the total variance. This ultimate solution necessitated the exclusion of items 1, "In general, would you say your health is...," and 4, "Did you accomplish less than you would like?" from the physical component subscale. It also excluded 28A, "Issues with the fistula?" from the renal disease symptoms/ problems subscale, and 35 "Your sex life?" from the renal disease effects subscale. This illustrates a model that identifies the established theoretical factors. These thirty-one items underwent Bartlett's test of sphericity (8677.993, df=465, Sig.<.001) and a significant Kaiser-Meyer-Olkin hypothesis test (0.918). Tables 3 and 4.

4.5 Construct Validity: Confirmatory Factor Analysis

The Confirmatory Factor Analysis (CFA) results for KDQOL-36™ data fitted with the hypothetical five-factor model with $\chi 2/df = 2.2$, RMSEA = 0.042 (90% CI 0.038–0.045), CFI = 0.939, GFI = 0.923, AGFI = 0.906, TLI = 0.931 and RMR = 0.058. The KDQOL-36™. The model had lower goodness-of-fit parameters when run without covariations (data not shown). For details, refer to Table 5.

V. DISCUSSION

Most previous studies assessing the validity of the KDQOL-36™ focused on Western populations, with only a few South American countries utilizing the KDQOL-36™ (22, 23, 28, 31, 39, 39–42). The findings suggest that the KDQOL-36™ demonstrates an excellent level of reliability, as indicated by McDonald's Omega values, and validity in comprehending the quality of life among HD patients in Bolivia. The assessment of scale reliability in Latin America using Mc Donald's omega coefficient reveals slight differences compared to those obtained by Valderrama in 2024 with 506 patients in Colombia. For the dimension of renal disease burden, the author demonstrated an omega of 0.82, whereas in the present study, it was 0.755. In the dimension of symptoms and problems related to renal disease, the study estimated an omega of 0.855, contrasting with 0.80 in the present study. Additionally, for the dimension of effects of renal disease, the author estimated an omega of 0.82, slightly higher than the 0.809 found in this study (42). In other countries, Rokhman in 2022 obtained omega values for generic domains of 0.62 and 0.84, and for specific renal domains, the values ranged from 0.56 to 0.92 in Bahasa Indonesia. This underscores the KDQOL-36 questionnaire's robust reliability indices (43). The results of this cross-sectional study provide valuable insights into the HRQOL among HD patients in Bolivia.

Exploratory factor analysis supported the presence of five subscales, as proposed by the instrument's developers. The Physical Component and Emotional Component subscales showed high factor loadings (>0.7), while the other domains exhibited reasonably good relationships, indicating a strong correlation among items within these subscales. Estimates of internal consistency reliability for the KDQOL-36™ and its eight subscales surpassed scores indicative of good reliability. Items generally correlated more

with others within their subscale than with items in other subscales, aligning with studies conducted in Greek, Korean, Singaporean, or Chinese HD patients with sample sizes exceeding 500 participants.

All these results endorse the use of the KDQOL-36™ with HD patients in Bolivia. However, attention should be directed to the four items that demonstrated lower factor loadings: "In general, would you say your health is...", "Did you accomplish less than you would like?", "Issues with the fistula?" and "Your sex life?". These lower factor loadings may stem from cultural differences, suggesting that Bolivians may perceive these items as about other latent variables. The implementation of the KDQOL-36™ in Bolivia holds significant clinical and public health implications. This questionnaire offers a detailed assessment of health-related quality of life in hemodialysis patients, enabling the identification of specific areas for improvement. The results can inform resource allocation, improve doctor-patient communication, aid in public health decision-making, and serve as a basis for research and the development of personalized interventions. The KDQOL-36™ emerges as a valuable tool for comprehending and addressing the needs of the hemodialysis patient population in Bolivia. Recognizing the inherent limitations of cross-sectional studies and the cultural diversity in Bolivia, a more in-depth exploration of the transcultural adaptation of the KDQOL-36 questionnaire in various cultural contexts spanning the different ecological zones in the country is recommended. Furthermore, it is suggested to implement research designs that surpass the constraints typically associated with cross-sectional studies.

VI. CONCLUSIONS

The validation of the KDQOL-36™ in Bolivia underscores the robustness and utility of the questionnaire in assessing HRQOL among patients undergoing HD in the country. The transcultural adaptation of the instrument has proven to be appropriate, yielding reliable and valid data within the Bolivian context. The obtained results suggest that the KDQOL-36™ is an effective tool for identifying specific areas of improvement in the quality of life of hemodialysis patients, providing valuable guidance for intervention strategies and resource allocation.

The internal consistency and reliability of the questionnaire, assessed through indicators such as McDonald's omega coefficient, further enhance its validity and credibility in the Bolivian context. Moreover, the significance of recognizing the inherent limitations of cross-sectional studies and cultural diversity in Bolivia is emphasized. The necessity for future research to explore transcultural adaptation in diverse cultural and geographical contexts within the country, along with the implementation of research designs that overcome constraints associated with cross-sectional studies, is recommended. The successful validation of the KDQOL-36 in Bolivia not only strengthens the evidence base for the care of HD patients in the country but also sets a valuable precedent for future research and the continuous enhancement of the quality of life in this specific population.

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DISCLOSURES

Ethics approval and consent to participate: Informed consent was obtained or waived by all participants in this study. Ethical approval (approval: COMETICA-RESOLUCIÓN Nro.02/2023 August 18, 2023) was obtained from the Ethical and Bioethical Committee of Faculty of Medicine, Nursing, Nutrition, and Medical Technology at Major University of San Andrés.

The study was conducted as per the tenets of Declaration of Helsinki and all participants signed an informed consent form. Participants were free to withdraw from the study at any point.
Publication consent. The authors grant their consent for the publication of the study.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available at https://www.synapse.org. DOI https://doi.org/10.7303/syn52541509.

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Authors' contributions

AEGA, have made substantial contributions to conception and design of the study. AEGA and KDQG were responsible for the acquisition of data. AEGA and RSS have made the analysis, interpretation of data, drafted the work and substantively revised it.

All authors were involved in drafting the manuscript or revising it critically for important intellectual content; and all have given final approval of the version to be published, and have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

They have agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table 1: Sociodemographic characteristics of the sample (n = 724)

Characteristics		n (%)
Gender	Male	351 (48.5%)
	Female	373 (51.5%)
Age in years (Mean, SD*)		55.9 (14.4)
Education	None	39 (5.4%)
	Primary school	316 (43.6%)
	Secondary school	197 (27.2%)
	High school graduate	128 (17.7%)
	Graduate studies	44 (6.1%)
Marital status	Single	128 (17.7%)
	Married	435 (60.1%)
	Divorced	68 (9.4%)
	Widowed	93 (12.8%)
Subsector of the health system	Public	197 (27.2%)
	Short-term social security	51 (7.0%)
	Private	476 (65.7%)
Months on hemodialysis (Mean, SD*)		31.4 (31.4)
Occupation	Executive or administrative manager	6 (0.8%)
	Military personnel	11 (1.5%)
	Agricultural, forestry, or fishing worker	14 (1.9%)
	Office employee	19 (2.6%)
	Middle-level technician	21 (2.9%)
	Facility operators, machinery operators, or assemblers	65 (9.0%)
	Construction, manufacturing, or other trade worker	84 (11.6%)
	Scientific or intellectual professional	85 (11.7%)
	Unemployed	91 (12.6%)
	Service or sales worker	110 (15.2%)
	Unskilled worker	218 (30.1%)

SD Standard Deviation

Table 2: Descriptive statistics of the KDQOL-36™

KDQOL-36™ Subscales	Mean	SD*	95% CI	Minimal	Maximal	Omega	Standardized results Omega
Physical Composite Sore	34.20	8.87	33.55-34.85	11.72	60.20	.704	.792
Mental Composite Score	39.93	10.68	39.15-40.71	13.99	66.96	.659	.777
Burden of kidney disease	24.61	18.80	23.24-25.98	0.0	100	.755	.780
Symptoms/problems list	67.13	17.82	65.83-68.43	10.42	100	.855	.856
Effects of kidney disease	47.47	19.92	46.02-48.93	0.0	96.88	.809	.815

SD Standard Deviation

Table 3: Communalities matrix

Selected Items	Communalities	
	Initial	Extraction
2 Does your current health limit you from doing moderate activities, such as moving a table, sweeping, or walking?	1.000	0.676
3 Does your current health limit you from climbing several flights of stairs?	1.000	0.702
5 Did it take more effort than usual to perform your job or daily activities?	1.000	0.461
8 How much has pain made it difficult for you to do your usual work?	1.000	0.738
6 Did you accomplish less than you would have liked due to emotional problems?	1.000	0.715
7 Did you not do your work or daily activities as carefully as usual due to emotional problems?	1.000	0.449
9 Did you feel calm and peaceful?	1.000	0.440
10 Did you have a lot of energy?	1.000	0.522
11 Did you feel downhearted and blue?	1.000	0.436
12 Have your physical health or emotional problems made it difficult for you to carry out your usual social activities?	1.000	0.415
13 My kidney disease interferes too much with my life	1.000	0.687
14 My kidney disease takes up too much of my time	1.000	0.642
15 feel frustrated having to deal with my kidney disease	1.000	0.719
16 I feel like a burden to my family	1.000	0.510
17 Muscle cramps?	1.000	0.485
18 Chest pain?	1.000	0.461
21 Dry skin?	1.000	0.398
22 Shortness of breath?	1.000	0.437
23 Fainting or dizziness?	1.000	0.478
24 Loss of appetite?	1.000	0.419
25 Exhausted, no energy?	1.000	0.330
26 Numbness in hands or feet?	1.000	0.503
27 Nausea or stomach discomfort?	1.000	0.465
19 Cramps?	1.000	0.498
29 Limitation in fluid intake?	1.000	0.548
30 Dietary limitations?	1.000	0.621
31 Your ability to work around the house?	1.000	0.570
32 Your ability to travel?	1.000	0.448
33 Depending on doctors and other health personnel?	1.000	0.483
34 Nervousness or worries caused by your kidney disease?	1.000	0.543
36 Your physical appearance?	1.000	0.373

Table 4: Rotated Component Matrix

Selected Items	Symptoms /problems list	Physical Composite Sore	Effects of kidney disease	Mental Composite Score	Burden of kidney disease
2 Does your current health limit you from doing moderate activities, such as moving a table, sweeping, or walking?		0.798			
3 Does your current health limit you from climbing several flights of stairs?		0.807			
5 Did it take more effort than usual to perform your job or daily activities?		0.544		0.350	
8 How much has pain made it difficult for you to do your usual work?	0.325	0.465			

6 Did you accomplish less than you would have liked due to emotional problems?				0.825	
7 Did you not do your work or daily activities as carefully as usual due to emotional problems?				0.813	
9 Did you feel calm and peaceful?		0.369		0.435	
10 Did you have a lot of energy?		0.616			
11 Did you feel downhearted and blue?				0.516	
12 Have your physical health or emotional problems made it difficult for you to carry out your usual social activities?				0.514	
13 My kidney disease interferes too much with my life					0.774
14 My kidney disease takes up too much of my time					0.780
15 feel frustrated having to deal with my kidney disease					0.760
16 I feel like a burden to my family				0.517	0.441
17 Muscle cramps?	0.603				
18 Chest pain?	0.627				
21 Dry skin?	0.638				
22 Shortness of breath?	0.661				
23 Fainting or dizziness?	0.621				
24 Loss of appetite?	0.438				
25 Exhausted, no energy?	0.431	0.400			
26 Numbness in hands or feet?	0.660				
27 Nausea or stomach discomfort?	0.679				
19 Cramps?	0.609				
29 Limitation in fluid intake?			0.723		
30 Dietary limitations?			0.756		
31 Your ability to work around the house?		0.397	0.540		
32 Your ability to travel?			0.614		
33 Depending on doctors and other health personnel?			0.619		
34 Nervousness or worries caused by your kidney disease?	0.326		0.464		0.358
36 Your physical appearance?	0.342		0.412		

Table 5: Expected fit indices for a structural equation model and obtained indices in CFA

Fit Index	Expected	CFA Model Fit
Model chi-Square(χ^2)	> 0.05	0.00
Relative/normed chi-squareCMIN/DF	< 5	2.248
Goodness-of-fit statisticGFI	0.9 – 1	0.923
Adjusted goodness-of-fit statisticAGFI	0.9 – 1	0.906
Root mean square residualRMR	Close to 0	0.058
Root mean square error of approximationRMSEA	< 0.05	0.042
Comparative fit indexCFI	0.9 – 1	0.939
Normed-fit indexNFI	0.9 – 1	0.896
Tucker-Lewis indexTLI	0.9 – 1	0.931

Expression of Selectins in the Development of Diabetic Nephropathy in Patients with Type 2 Diabetes

T. S. Ryabova & I. A. Rakityanskaya

ABSTRACT

Research Objective: The work is devoted to studying the role of the expression of P-selectin (CD62P) and E-selectin (CD62E) in the glomerular capillary endothelium and peritubular capillaries and their role in the development and progression of morphological changes in renal tissue during diabetic nephropathy in patients with type 2 diabetes mellitus.

Material and Methods: The examination was carried out in 50 patients with type 2 diabetes mellitus (average age 66.58±3.27 years). All patients underwent light and immunofluo-rescence microscopy of renal tissue biopsies obtained by intravita percutaneous kidney biopsies. Morphological changes in tissue were assessed in accordance with the latest international classification of diabetic nephropathy, developed in 2010. According to light microscopy, class IIa (mild mesangial expansion) was identified in 12 patients, class IIb (severe mesangial expansion) was identified in 14 patients. , in 19 patients – class III (nodular Kimmelstiel-Wilson lesions) and in 5 patients – class IV (advanced diabetic glomerulosclerosis).

Keywords: type 2 diabetes mellitus, diabetic nephropathy, P-selectin (CD62P), E-selectin (CD- 62E), kidney tissue biopsy, microvascular complications.

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ABSTRACT

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The expression of P- and E-selectin was determined using monoclonal antibodies labeled with FITC (anti-human CD62P (P-Selectin) Antibody and anti-human CD62E (E-Selectin) Antibody) (USA). The intensity of expression in points (0–4), the nature and location of selectin expression in the glomerular endothelium and in peritubular capillaries were assessed.

Results. Analysis using linear and exponential regression was performed to identify the prognostic significance of CD62P and CD62E expression in the progression of tissue morphological changes during the development of DN. The resulting models demonstrated the role of selectin expression in the development of mesangial matrix expansion, the formation of nodular Kimmelstiel–Wilson lesions, arteriolar hyalinosis, and tubulointerstitial lesions.

Conclusion: Based on the data obtained, it can be assumed that the cell adhesion molecules P- and E-selectins are a predictor of the development of microvascular complications in DN. Expression of CD62P and CD62E in glomerular capillary endothelium influences the progression of DN.

Keywords: type 2 diabetes mellitus, diabetic nephropathy, P-selectin (CD62P), E-selectin (CD-62E), kidney tissue biopsy, microvascular complications.

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(T2DM)

Diabetic kidney disease (DKD) is a severe complication of diabetes mellitus, which is currently one of the leading causes of chronic kidney disease (CKD) and end-stage renal failure (ESRD) worldwide [1, 2]. Globally, diabetes mellitus (DM) affects more than 8% of the planet's population (about 350 million people).

Moreover, the International Diabetes Federation (IDF) estimates that the prevalence of diabetes will increase to 642 million people by 2040 [3, 4, 5]. More than 40% of people with diabetes develop kidney disease.

DKD is one of the main microvascular complications of diabetes, which is characterized by structural and functional changes. The morphological changes observed in kidneys with DN affect almost all nephron structures: the glycocalyx and glomerular endothelial cells, the glomerular basement membrane, podocytes and slit diaphragm, the mesangial matrix, the renal interstitium and renal tubules [6]. The earliest signs of DN are thickening of the glomerular basement membrane (GBM), soft mesangial expansion, and arteriolar hyalinosis. Mesangiolysis and severe mesangial damage ultimately lead to severe mesangial expansion, formation of nodular Kimmelstiel-Wilson lesions, hyalinosis of afferent and efferent arterioles, and marked thickening of the GBM. Glomerular lesions occur together with specific vascular lesions, including arteriolar hyalinosis, as a result of the accumulation of hyaline material, a product of exudation of plasma proteins, which usually occurs in the structure of both afferent and efferent arterioles [7, 8, 9]. A major contribution to the development of segmental sclerosis of the glomeruli is made by the detachment of podocytes from the GBM; as a result, the outflow from the glomeruli is disrupted and the so-called atubular glomeruli develop, which are characteristic of DN.

Recently, it has been shown that renal tubular damage is not only secondary to glomerular damage, but is itself a contributing factor to the development of DKD in patients with or without proteinuria [10, 11]. Various mechanisms are involved in the primary damage to proximal tubules in very early stages of DKD, including hypoxia, mitochondrial dysfunction, activation of innate immune mechanisms and autophagy [11].

The inflammatory response in the tubules leads to the development of nonspecific tubulointerstitial changes, including tubular atrophy, accumulation of activated myofibroblasts, collagen, inflammatory cells, and loss of capillary architecture [12]. Morphological damage to renal tissue in types 1 and 2 diabetes is identical, although there is a point of view that the heterogeneity of type 2 diabetes plays an additional role [13].

Chronic inflammation plays an important role in the development of DKD. In 1991, A. Bohle et al. [14] for the first time conducted a study of kidney biopsies from 488 patients with diabetic glomerulosclerosis of varying severity and revealed the presence of monocytes, macrophages, T cells and fibroblasts in the kidney tissue associated with tubulointerstitial changes in DKD. The authors suggested that diabetic nephropathy develops not only due to hyperperfusion lesions, but also due to nonspecific tubulointerstitial changes. Patients with type 2 diabetes develop systemic inflammation, including the production of a wide variety of chemokines that promote inflammation in the microenvironment, thereby expanding and increasing renal damage. As a result of inflammation, the renal tissue is infiltrated by monocytes and lymphocytes, which produce proinflammatory cytokines (IL-6, IL-8, IL-10, TNF-α), chemokines (CCL2/C-C motif ligand 2), adhesion molecules (ICAM-1 and VCAM-1, P-selectin, E-selectin) and oxygen-free radicals, which further enhances the inflammatory response with the development of cell damage and the development of fibrosis [15, 16].

There is evidence of the key role of activated platelets in the development of inflammation, coagulation disorders and tissue fibrosis, resulting in the development and progression of DKD [17, 18]. In inflammatory diseases, an increase in the expression of adhesion molecules is observed, which is considered an indicator of endothelial damage. In patients with T2DM, platelets are characterized by increased expression of adhesion molecules, which is an indicator of endothelial damage and leukocyte activation [19]. Adhesion molecules are divided into four categories: integrins, selectins, adhesion molecules that are part of the immunoglobulin superfamily, and cadherins [20]. The selectin family consists of three molecules called P-, E-, and L-selectins. P- and E-selectins play an important role in the mechanisms of pathogenesis of the development

of DN. P-selectin (CD62P) is a membrane glycoprotein with a high degree of glycosylation, deposited in specific granules localized in α-granules of platelets and in endothelial cells in the membrane of the Weibel-Palade body [18, 21].

When platelets are stimulated, P-selectin is rapidly redistributed from α-granules to the platelet surface [22]. E-selectin (CD62e), a membrane glycoprotein, is produced in large quantities and is expressed only on activated endothelium, promoting the adhesion of monocytes and neutrophils to the endothelium [23].

The purpose of the research was to study the role of the expression of P- and E-selectins (CD62p and CD62e) in the glomerular capillary endothelium and peritubular capillaries in patients with different morphological classes of DN and to evaluate their influence on the development and progression of histological changes in renal tissue.

I. PARENTS AND METHOD

The study included 50 patients with type 2 diabetes mellitus (DM), complicated by the development of diabetic nephropathy. The average age of the patients was 66.58±3.27 years. There were 35 women, 14 men. The duration of disease in patients with diabetes was 17.70 ± 0.35 years. The duration of DN from the moment of detection of microalbuminuria to the morphological examination of the renal tissue and diagnosis was 1.65 ± 0.34 years.

The material for histological examination was obtained through intravita percutaneous kidney biopsies and was subsequently examined by light and immunofluorescence microscopy. Morphological changes in tissue were assessed in accordance with the latest international classification of diabetic nephropathy developed by the Scientific Committee of the Pathology Society, USA [24].

Light microscopy of kidney biopsy tissue was assessed using the following indicators.

1. The presence of global and segmental glomerular sclerosis;
2. Cellularity of the glomerulus;
3. Severity of expansion of the mesangial matrix (less than and more than 25%);
4. GBM thickening;
5. Kimmelstiel–Wilson nodules;
6. Presence of hyaline caps;
7. Periglomerular sclerosis;
8. Sclerotic changes in the interstitium;
9. The presence and severity of mononuclear inflammatory infiltrates in the interstitium;
10. The presence of protein masses in the lumens of the tubules;
11. Atrophy and dystrophy of the epithelium of the urinary tubules (thickness of the apical edge and height of the epithelium of the tubules);
12. Hyalinosis of afferent and efferent arterioles.

The severity of morphological changes was assessed using a semi-quantitative method in points (0–3). Global and segmental glomerular sclerosis was assessed as the percentage of globally and segmentally sclerotic glomeruli from the total number of glomeruli in the nephrobiopsy section. Interstitial fibrosis and tubular atrophy (IFTA) was scored (0–3) as a percentage of the total interstitial and tubular area in the biopsy specimen. Mononuclear infiltration (IM), afferent and efferent hyalinosis (AH) were also scored (0–2 and 0–2, respectively) according to the criteria of the international classification of DN [24].

According to light microscopy, class IIa (mild mesangial expansion) was detected in 12 patients, class IIb (severe mesangial expansion) in 14 patients, class III (nodular Kimmelstiel-Wilson lesions) in 19 patients, class IV in 5 patients (advanced diabetic glomerulosclerosis).

In addition to light microscopy, the expression of CD62P (P-selectin) and CD62E (E-selectin) in the glomerular endothelium and peritubular capillaries was determined in all patients using monoclonal antibodies labeled Fitc (FITC anti-human CD62P (P-Selectin) Antibody, clone AK4 Cat#304904 and FITC anti-human CD62E (E-Selectin) Antibody, clone HCD62E Cat# 322606, Biolegend (USA)). The intensity of expression was assessed in points (0–4) [25], the

nature and location of the expression of CD62P and CD62E in the glomerular endothelium and in peritubular capillaries.

II. STATISTICAL ANALYSIS

Statistical processing of the obtained data was carried out using the IBM SPSS Statistics software package, version 26 (Armonk, NY: IBM Corp.). Group results are presented as the arithmetic mean ± standard error (M ± Standard Error).

Statistical comparison of data between groups of patients was carried out using the nonparametric Mann–Whitney U test. Differences in continuous variables were assessed using the independent sample Student's t test and were considered significant if $p \leq 0.05$.

For statistical processing, parametric (Pearson's method) and non-parametric (Spearman's method, Kendall's tau (τ) method) were used. To verify compliance with the condition of independence of observations, linear regression analysis was carried out (with the calculation of the coefficient of determination (R Square) and the Durban–Watson test) and analysis of variance (ANOVA Analisis of Variance) with the calculation of the Fisher test (F) to test the significance of the model. The standardized ß coefficient with 95% confidence intervals was calculated. The critical level of significance for the difference in indicators was taken equal to 0.05.

III. RESULT

Analysis of the expression of P- and E-selectins in renal tissue showed that expression is present in the area of glomerular endothelium and periglomerular capillaries. The results are presented in Table 1.

Table 1: Intensity of expression of CD62p and CD62e in the glomerular endothelium and peritubular capillaries in patients with type 2 diabetes with DN

Expression area	Expression intensity CD62P	Expression intensity CD62E	P
Glomerular endothelium	1,63±0,47 (95% CI:0,95 – 2,72)	0,64 ±0.13 (95% CI: 0,36 – 0,91)	0,001
Peritubular capillaries	1,17±0,13 (95% CI: 0,91 – 1,42)	0,95±0,18 (95% CI:0,61 – 1,29)	0,001

The table data shows that the expression of CD62P in both zones is significantly more pronounced. Next, the expression of CD62P and CD62E in renal tissue was analyzed depending on the class of DN (Table 2, 3)

Table 2: Intensity of CD62P expression in the glomerular endothelium and peritubular capillaries in groups of patients with different classes of DN

Expression area	IIa class (n = 12) (1)	IIb class (n = 14) (2)	III class (n = 19) (3)	IV class (n = 5) (4)	P
Expression of CD62P in glomerular endothelium					
Glomerular endothelium	3,500±2,088 (95% CI: -1,224 - 8,224)	1,500± 0,291 (95% CI: 0,869 – 2,130)	1,000±0,253 (95% CI: 0,467 – 1,532)	0,000	P1,2=0,04 P1,3=0,001 P1,4 =0,0001 P2,3 =0,04 P2.4 =0,0001 P3,4=0,0001
Expression of CD62P in peritubular capillaries					
Peritubular capillaries	1,600±0,266 (95% CI: 0,996 - 2,203)	1,214±0,280 (95% CI: 0,607 – 1,821)	0,842±0,191 (95% CI: 0,440 – 1,244)	0,297±0,109 (95% CI: 0,106 – 0,531)	P1,2 =0,05 P1,3 =0,001 P1,4=0,001 P2,3=0,05 P2,4=0,001 P3,4=0,05

Table 3: Intensity of CD62E expression in the glomerular endothelium and peritubular capillaries in groups of patients with different classes of DN

Expression area	IIa class (n = 12) (1)	IIb class (n = 14) (2)	III class (n = 19) (3)	IV class (n = 5) (4)	P
Expression of CD62E in glomerular endothelium					
Glomerular endothelium	0,900±0,349 (95% CI: 0,200– 1,600)	0,428±0,226 (95% CI: 0,063 -0,920)	0,421±0.183 (95% CI: 0,157 – 0,736)	0,000	P1,2=0,001 P1,3 =0,001 P1,4=0,0001 P2,3=0,07 P2,4=0,0001 P3,4=0,0001
Expression of CD62E in peritubular capillaries					
Peritubular capillaries	1,400±0,452 (95% CI: 0,600 - 2,203)	0,785±0,309 (95% CI: 0,2143 – 1,498)	0,684±0,212 (95% CI: 0,315 – 1,157)	0,195±0.088 (95% CI: 0,042 – 0,383)	P1,2=0,001 P1,3=0,001 P1,4=0,0001 P2,3=0,08 P2,4=0,004 P3,4=0,002

From the presented data it is clear that the expression of selectins in renal tissue depends on the morphological class of DN.

Next, a correlation analysis of the relationship between the expression of selectins in renal tissue and morphological changes in the general group of patients was carried out. The obtained data are presented in Table 4.

Table 4: Correlations between the expression of CD62P and CD62E in the glomerular endothelium with morphological changes in the general group of patients with DN

Morphological changes	Correlations		
	Kendall (τ)	Spearman (r)	Pearson (R)
Expression of CD62P in glomerular endothelium			
Glomerular basement membrane thickening	τ=-0,289 p=0,029	r=-0,319 p=0,029	R=-0,357 =0,014
Kimmelstiel–Wilson nodules	τ=-0,289 p=0,26	r=-0,325 p=0,025	R =-0,326 p= 0,025
Hyalinosis of arterioles	τ= -0,316 p=0,015	r = -0,378 p=0,009	R =-0,340 p=0,019
Expression of CD62E in glomerular endothelium			
Kimmelstiel–Wilson nodules	τ= - 0,289 p=0,026	r= -0,325 p=0,026	R = - 0,300 p=0,040
Hyalinosis of arterioles	τ= - 0,298 p=0,026	r= - 0,355 p=0,014	R = - 0,324 p=0,026

To identify the prognostic significance of the expression of CD62p and CD62e and their role in the progression of morphological changes in renal tissue during the development of DN, linear regression analysis was carried out with the calculation of determination coefficients R2 (R Square) and analysis of variance (ANOVA Analysis of Variance) using the F test with 95% confidence interval. The obtained values, indicating the significance of the regression models, are presented below (Table 5, 6).

Table 5: Regression models of the significance of CD62P and CD62E expression in the glomerular endothelium in the general group of patients with DN

Selectin expansion zone	Coefficient of determination (R^2)	Fisher criterion (F)	p
Expression of CD62P in glomerular endothelium			
Expansion of the mesangial matrix	0,317	21,317	0,000
Hyalinosis of arterioles	0,213	12,476	0.001

	-	-	-
Glomerular basement membrane thickening	0,255	15,708	0.000
Expression of CD62E in glomerular endothelium			
Expansion of the mesangial matrix	0,206	11,926	0,001
Kimmelstiel–Wilson nodules	0,125	6,556	0,014
Glomerular basement membrane thickening	0,216	13,926	0,001
Hyalinosis of arterioles	0,206	13,202	0.001

Table 6: Regression models of the significance of CD62P and CD62E expression in the peritubular capillaries in the general group of patients with DN

Selectin expansion zone	Coefficient of determination (R^2)	Fisher criterion (F)	p
Expression of CD62P in peritubular capillaries			
Atrophy of the tubular epithelium	0,558	6,632	0.013
Interstitial sclerosis	0,549	54,732	0,0001
Expression of CD62E in peritubular capillaries			
Atrophy of the tubular epithelium	0,356	25,462	0,0001
Interstitial sclerosis	0,338	22,932	0,0001

From the data presented in the table it is clear that the expression of CD62P and CD62E has a pronounced effect on the development and progression of morphological changes in the renal tissue in patients with DN. Next, we analyzed the influence of the expression of CD62P and CD62E on the progression of the stage of DN in the general group of patients (Table 7).

Table 7: Regression models of the significance of CD62P and CD62E expression in the glomerular endothelium on the progression of the stage of DN in the general group of patients

Glomerular capillary endothelium	Coefficient of determination (R^2)	Fisher criterion (F)	p
Expression of CD62P	0,216	12,684	0,001
Expression of CD62E	0,204	11,779	0,001

IV. DISCUSSION

In the pathogenesis of glomerular diseases, platelets play an active role through mechanisms involved in the development of the inflammatory process. Numerous studies have shown increased platelet activation in patients with diabetes (2With increased platelet hyperreactivity in patients with diabetes, proteins are released from α-granules, dense granules and lysosomal granules, which act as pro-inflammatory mediators, pro-fibrotic mediators, growth factors and vasoactive mediators that contribute to the pathophysiological mechanisms of DN development [26, 18]. Proinflammatory mediators increase the expression of adhesion molecules on the endothelium and initiate the migration of leukocytes to the site of inflammation. The migration of leukocytes from blood to tissues involves several stages: coagulation, adhesion, diapedesis, and chemotaxis (27). The earliest and necessary event is coagulation, which initiates leukocyte extravasation and inflammation. Blood coagulation is mediated by a family of adhesion molecules, including various ligand/receptor molecules that promote intercellular and intercellular-ECM adhesion [28]. Selectins include endothelial E-selectin, platelet P-selectin and leukocyte L-selectin [29].

Selectins are involved in the constitutive return of leukocytes and in chronic and acute inflammatory processes [23]. E- and P-selectins are expressed by endothelial cells. P-selectin is the main

mediator of platelet and leukocyte aggregation. When P-selectin interacts with P-selectin glycoprotein ligand-1 (PSGL-I), which is expressed on the membrane of monocytes and neutrophils, adhesion of platelets and endothelial cells to leukocytes occurs [2]. PSGL-1 has high affinity for P-selectin. E-selectin is produced upon pro-inflammatory stimulation and is considered important for leukocyte transport [30, 31]. Gotoh R. et al. showed in their work that E-selectin regulates adventitial inflammation through leukocyte adhesion and promotes the process of intimal hyperplasia [32].

The most comprehensive and one of the first studies of the expression of P- and E-selectins in renal tissue from T2DM patients with DN was published by Roy-Chaudhury Prabir et al. in 1996. The study was conducted on 119 biopsy blocks of kidneys taken from patients with different morphological diagnoses. The expression of P- and E-selectins on extraglomerular vascular endothelium was assessed. The authors showed that the expression of adhesion molecules in the tubulointerstitium is associated with interstitial fibrosis and tubular atrophy and may contribute to the progression of kidney disease (E-selectin (0.71, P <0.0001) and P-selectin (0.72, P <0 ,0001)). Spearman's correlation was found regardless of the morphological form of the primary diagnosis, but was clearly associated with histological damage. Expressions of E-selectin (P < 0.0001) and P-selectin (P < 0.0001) were dramatically increased in extraglomerular capillaries. The authors of the work showed that there is a common pathway of tubulointerstitial damage, regardless of the primary diagnosis, and the expression of adhesion molecules within the tubulointerstitium may be an important mechanism in the pathogenesis of DN [33].

In our study, regression analysis showed that the expression of CD62P and CD62E contribute to the development of interstitial sclerosis and atrophy of the tubular epithelium. This confirms previously published data on morphological changes in diabetic nephropathy [33]. Also, the mechanism of tubulointerstitial damage and progression of DN is confirmed by our regression model of the relationship between the expression of CD62P and CD62E with the progression of the stage of DN in the general group of patients.

Taken together, these data support the hypothesis of Roy-Chaudhury Prabir et al. about the unified mechanism of tubulointerstitial damage and the significant role of the expression of CD62P and CD62E molecules in its development.

The literature contains data on a comparative analysis of the intensity of selectin expression in DN, lupus nephritis, membranous proliferative glomerulonephritis and IgA nephropathy [34].

There is also evidence of increased serum levels of E-selectin and P-selectin in patients with diabetes [35, 36]. Several cross-sectional studies have assessed the expression of cell adhesion molecules in blood [37] and renal tissue [38] and identified them as markers of endothelial dysfunction associated with the incidence of various microvascular complications of diabetes. In our study, the expression of P- and E-selectins was detected in the glomerular endothelium and in the peritubular capillaries of the renal tissue of patients. Regression analysis showed the influence of CD62P expression on the development of expansion of the mesangial matrix, arteriolar hyalinosis, and basement membrane thickening. CD62E expression promotes the development of mesangial matrix expansion, Kimmelstiel–Wilson nodules, arteriolar hyalinosis, and basement membrane thickening. Our data confirm and agree with data published by other authors.

It is known from the literature that in the early stages of DN, matrix expansion is formed due to the expansion of glycoproteins, collagen I, collagen III, collagen IV (α1 and α2 chains), collagen V, collagen VI, laminin, fibronectin and small leucine-rich (SLR) proteoglycans and other structural components. That is, expansion of the mesangial matrix is the result of metabolic disturbances caused by chronic hyperglycemia, which leads to an imbalance between the synthesis of extracellular matrix (ECM) glycoproteins and their degradation [39, 40, 41].

An inverse relationship was shown between the relative volume of the mesangium and the surface

filtration density of peripheral capillaries, as well as an inverse relationship between the surface filtration density and the density of the endothelial-mesangial border (r=-0.86 p=0.0005 – correlation of the percentage of total mesangium and peripheral S/V surface of capillaries) [42]. This mechanism can probably explain the regression models we obtained.

V. CONCLUSION

A study of biopsy tissue from patients with DN demonstrated the role of the expression of P- and E-selectins in the development of histological changes in renal tissue. P-selectin plays a greater role in the development of expansion of the mesangial matrix and the formation of Kimmelstiel–Wilson nodules with arteriolar hyalinosis. Both selectins play a role in the development of tubulointerstitial lesions.

In the future, it is planned to study the expression of other adhesion molecules and their role in the morphological changes of renal tissue in DN.

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Authors' contribution

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Rapidly Involving Congenital Hemangioma, Report of a Clinical Case

Dr. Marta Torres Díaz, Dr. Sara Comellas Cruzado & Dr. Carolina Moreno Hurtado

INTRODUCTION

Congenital hemangiomas are benign vascular tumors fully developed at the time of delivery, in which the proliferative phase occurs exclusively in utero, so they never increase in size (1). The incidence is similar in both sexes and there are four types according to the International Society for the Study of Vascular Anomalies (ISSVA), rapidly involuting congenital hemangioma (RICH), non-involuting congenital hemangioma (NICH) and slowly and partially involuting congenital hemangiomas (SICH and PICH) (2)(3). We present the case of a newborn male with a vascular tumor in the right knee.

Born at term by eutocic delivery after a controlled pregnancy with normal prenatal ultrasounds, the examination presented a rounded, painless, delimited and purplish mass in the right knee measuring about 5x5 cm (Figure 1). The lesion is neither friable or ulcerated. There are no other skin lesions. Femoral pulses are present and symmetrical. Cardiopulmonary auscultation is normal and there are no signs of heart failure.

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Figure 1. Evolution of the injury in the first years of life.

Doppler ultrasound was performed at birth, visualizing a hyperechogenic mass with serpingine structures in its thickness with Doppler uptake and high-velocity arterial and venous flow, compatible with a vascular anomaly such as a vascular tumor (4).

In initial blood analysis, moderate thrombopenia and normal coagulation. Assessed by Children's Cardiology, normal electrocardiogram and echocardiogram, minimal shunt from left to right through the foramen ovale in closing pathways with no evidence of ventricular dysfunction.

The study was completed with Magnetic Resonance (MRI), confirming a soft tissue tumor circumscribed in the anterior aspect of the right knee measuring 6.8 cm x 6.4 cm x 2.1 cm. The lesion appears isointense on T2 sequences with few serpinginous tubular structures with flow voids inside compatible with blood vessels. It presents varicose veins draining the Greater Saphena (SM) on the anterointernal aspect of the thigh. (Figure 2).

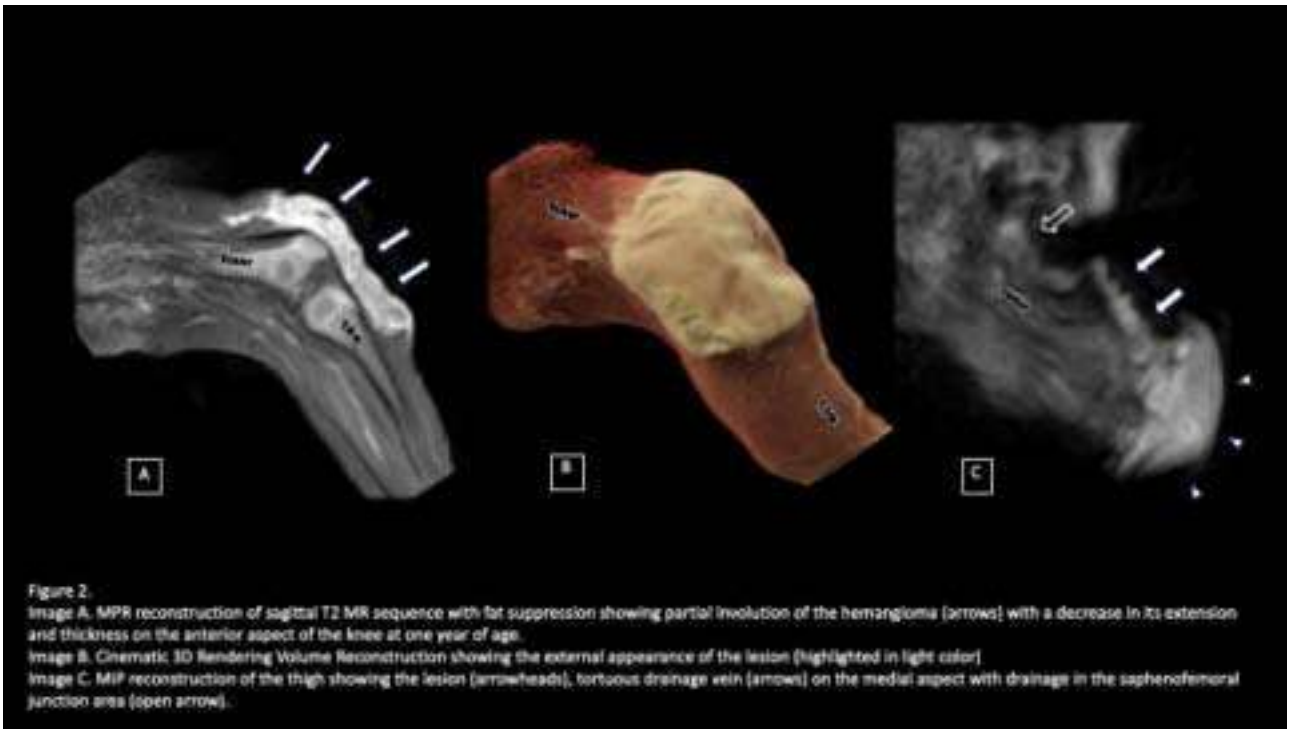

Figure 2.
Image A. MPR reconstruction of sagittal T2 MR sequence with fat suppression showing partial involution of the hemangioma (arrows) with a decrease in its extension and thickness on the anterior aspect of the knee at one year of age.
Image B. Cinematic 3D Rendering Volume Reconstruction showing the external appearance of the lesion (highlighted in light color)
Image C. MIP reconstruction of the thigh showing the lesion (arrowheads), tortuous drainage vein (arrows) on the medial aspect with drainage in the saphenofemoral junction area (open arrow).

Due to its full development at birth, its location and the absence of T2 hyperintensity and prominent flow voids on MRI, congenital hemangioma was considered the most likely diagnosis.

A wait-and-see attitude was decided, confirming during follow-up the progressive reduction in the size of the hemangioma (Figure 1) with normalization of platelet numbers in control analysis and disappearance of the shunt.

At one year of age, the mother reports that she sometimes has a lump in the right inguinal region. On examination, he presented a smaller vascular lesion in the right knee and a tumor in the root of the right thigh with varicosities on the anteromedial aspect of the thigh.

MID Doppler was performed, verifying that the clinical tumor corresponds to the dilated and incompetent arch of the SM, probably related to hyperflow of the varicosities visualized on MRI.

In subsequent controls, complete involution was confirmed at two years of age with residual skin atrophy on the anterolateral aspect of the knee with collateral vascularization that did not increase with the valsalva. The inguinal lump was reduced until it completely disappeared and the patient is currently leading a normal life without limitation or discomfort in the area.

We can conclude that this is a rapidly involuting congenital hemangioma (RICH). According to the ISSVA classification, it is a benign vascular tumor, which has regressed, with only mild hyperpigmentation and skin atrophy persisting.

They can present as violaceous tumors with telangiectasias and phlebectasias, hard pinkish bulging nodules with pale halos, compact and lobulated tumors with normal superficial skin color, or infiltrated violaceous plaques with a bluish halo.

We must perform a differential diagnosis with the rest of vascular tumors to avoid unnecessary

aggressive behavior since their evolution, prognosis and treatment are different (5). Due to the involution of the lesion, we ruled out other benign vascular tumors, such as infantile hemangioma or NICH hemangioma and tufted angioma.

As the thrombopenia resolved and there was no consumption coagulopathy, we rejected the hypothesis of more aggressive vascular tumors such as kaposiform hemangioendothelioma. The MRI characteristics, age, circumscribed nature with absence of congenital lymphedema and rapid progression made the possibility of epithelioid hemangioendothelioma and angiosarcoma unlikely (6).

RICH hemangiomas present more or less complete involution before the first year of life, with conservative treatment being sufficient in most cases. Pharmacological treatment is ineffective and excision exceptional. However, NICH hemangiomas do not present significant changes during their childhood, making their surgical removal necessary. ITS appearance requires an appropriate differential diagnosis with other soft tissue vascular tumors of the newborn of a locally aggressive and even malignant nature to choose the most appropriate management.

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Bullying es a Cause of Funtional Neurological Disorders (Conversion Disorder): A Case Report

Dr. Luís Alberto Chamorro Noceda & Dr. Adrián Denis

ABSTRACT

The conversion disorder, today called functional neurological disorder is a highly disabling condition both physically and mentally, which affects children simulating various diseases of the nervous system in its motor, sensitive or sensory components, difficult to diagnose, due to different causes with a prolonged evolution and generally causes social isolation in children; the neurofunctional picture requires for diagnosis using numerous medical tests with a high cost and burden for the health system that was previously done by ruling out. Bullying or school bullying is characterized by violence between peers at school, in which there is one or more bullies against the victim, using various types of violence, whether physical, emotional, psychological, and more recently cyberbullying, causing various traumas in the victim, sometimes with serious consequences for their health. In the present case, we describe a girl who was hospitalized due to highly disabling pain in the spine and lower limbs, which prevented her from sitting and walking, to which paresthesias were later added, which began after a traumatic accident. After several studies that ruled out an organic cause of the symptoms and their improvement with a placebo, a diagnosis of functional neurological disorder was made, which was later proven to have been caused by the stress of the bullying of whisch she was a victim.

Keywords: bullying, conversion disorders, funcional neurological disorders.

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Bullying es a Cause of Funtional Neurological Disorders (Conversion Disorder): A Case Report

Bullying Como Causa de Trastorno Funcional Neurológico (Trastorno Conversivo): Relato de un Caso

Dr. Luís Alberto Chamorro Noceda[α] & Dr. Adrián Denis[σ]

RESUMEN

El trastorno de conversión, hoy llamado trastorno neurológico funcional es una condición altamente discapacitante tanto física como mentalmente, que afecta a los niños simulando diversas enfermedades del sistema nervioso en sus componentes motores, sensitivos o sensoriales, de difícil diagnóstico, debido a diferentes causas con una evolución prolongada y que en general provoca aislamiento social en los niños; el cuadro neurofuncional requiere para su diagnóstico utilización de numerosos exámenes médicos con un alto costo y carga para el sistema sanitario que antes se hacía por descarte. El bullying o acoso escolar se caracteriza por la violencia entre pares en la escuela, en el cual existe uno o varios acosadores o bullies contra la víctima, que usando diversos tipos de violencia tanto sea física, emocional, psicológica y más recientemente el cyberbullying, causan variados traumas en la víctima a veces con graves consecuencias para su salud. En el presente caso describimos a una niña que fue internada por un cuadro de dolores en la columna y en los miembros inferiores, altamente incapacitante, que le impedía la sedestación y la deambulación al que posteriormente se agregan parestesias, que comenzaron posterior a un accidente traumático. Luego de varios estudios realizados que descartaron una causa orgánica de los síntomas y la mejoría de los mismos con placebo, se plantea el diagnóstico de trastorno neurológico funcional, que luego se comprobó haber sido causada por el estrés del bullying del cual fue víctima.

Palabras clave: bullying, trastorno conversivo, trastorno neurológico funcional.

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ABSTRACT

The conversion disorder, today called functional neurological disorder is a highly disabling condition both physically and mentally, which affects children simulating various diseases of the nervous system in its motor, sensitive or sensory components, difficult to diagnose, due to different causes with a prolonged evolution and generally causes social isolation in children; the neurofunctional picture requires for diagnosis using numerous medical tests with a high cost and burden for the health system that was previously done by ruling out. Bullying or school bullying is characterized by violence between peers at school, in which there is one or more bullies against the victim, using various types of violence, whether physical, emotional, psychological, and more recently cyberbullying, causing various traumas in the victim, sometimes with serious consequences for their health. In the present case, we describe a girl who was hospitalized due to highly disabling pain in the spine and lower limbs, which prevented her from sitting and walking, to which paresthesias were later added, which began after a traumatic accident. After several studies that ruled out an organic cause of the symptoms and their improvement with a placebo, a diagnosis of functional neurological disorder was made, which was later proven to have been caused by the stress of the bullying of whisch she was a victim.

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I. INTRODUCCIÓN

con cierta frecuencia los pediatras nos enfrentamos a cuadros clínicos complejos, de difícil diagnóstico y considerando al niño como un ser biopsicosocial, el encare holístico es de fundamental importancia para el diagnóstico final, sabiendo queningún niño es una isla ya que el mismo, su familia y la comunidad son un continuo sin fisuras, para lo cual se debe considerar la semiología y el contexto en que se desarrolla el cuadro clínico. El trastorno neurológico funcional TNF como es conocido actualmente el trastorno conversivo TC, cursa con una característica común de síntomas somáticos, sensitivos o motores que provocan deterioro significativo en la calidad de vida del paciente, no explicadas por una condición médica general y que puede deberse a factores estresantes psicológicos o por causas inexplicables; el diagnóstico no es un diagnóstico de exclusión como se hacía antes, sino que se basamenta en ciertas características clínicas que muestran incongruencia entre el movimiento voluntario alterado y el movimiento automático conservado y es el segundo motivo de consulta neurológica en la emergencia ((1).

Los síntomas son genuinos e incluyen trastornos motores como parálisis, temblor, distonía, trastornos del habla, convulsiones; alteraciones sensitivas como dolor, parestesias, anestesias o sensoriales como pérdida de visión, sordera; a los ya mencionados se puede agregar fatiga, problemas para dormir, de memoria, y síntomas disociativos. Las pseudoconvulsiones o crisis convulsivas no epilépticas CCNE son alteraciones paroxísticas en la conducta que simulan convulsiones epilépticas, pero sin una causa orgánica subyacente (2). Entre las varias causas del trastorno hay factores estresantes como el abuso sexual (3), siendo la comorbilidad alta en el trastorno de conversión, ya que se estima que el 85% de los pacientes tienen además otro trastorno psiquiátrico asociado como: depresión, ansiedad generalizada y neurastenia. La prevalencia ha aumentado en las últimas décadas y representa para el pediatra un desafío diagnóstico y terapéutico por su desconocimiento, ya que según un estudio reveló que sólo el 3% de los pediatras encuestados conocía el TC (4).

El bullying o acoso infantil es una conducta agresiva intencionada y perjudicial que se manifiesta entre escolares, no como unepisodio aislado, esporádico, sino persistente que puede durar semanas, meses e incluso años, en los cuales hay una agresión de parte del/os agresor/es a la víctima, con un abuso de poder e intención de intimidar y dominar, causándole daño que puede llevar a la víctima a la depresión o el suicidio (5). Existiendo varios tipos de bullying como maltrato físico, maltrato verbal, maltrato psicológico, maltrato indirecto y aunque es de vieja data se puede considerar al bullying como un trastorno emergente (6).

Creímos necesario presentar el caso de un trastorno neurológico funcional ocurrido a una niña, causado por bullying, cuyo diagnóstico se obtuvo por exclusión luego de que los estudios realizados fueron todos normales y debido al desconocimiento en general de los pediatras sobre el TFN, siempre desafiante y difícil por la variabilidad de los síntomas somatomorfos, para que pueda pensar en ese trastorno cuando se encuentre ante un cuadro neurológico inexplicable desde el punto de vista orgánico.

II. CASO CLÍNICO

MAC sexo femenino de 11 años de edad procedente de Caaguazú previamente sana, que fue traída e internada en el Servicio de Pediatría del Hospital Central del IPS el día 18/04/23 con el antecedente de dolor en la región lumbar posterior a traumatismo por caída de 2 metros de altura de un árbol en su escuela, de aproximadamente 48 horas de evolución que se fue acentuando con el correr de las horas, irradiándose luego a ambos miembros inferiores hasta llegar a impedirle la deambulación, no habiendo experimentado ninguna mejoría con la administración de varios analgésicos (ibuprofeno, paracetamol c/codeína, naproxeno), quele fueron dados en el Centro de salud de su comunidad (compañía de Caaguazú), ingresando

con el diagnóstico de lumbociatalgia por traumatismo en región lumbar, se le realizó RMN que reveló leve hinchazón de los discos intervertebrales en C3 y C4, sin alteraciones en los forámenes y del canal medular, por lo cual se descartó cualquier tipo de intervención quirúrgica por el servicio de neurocirugía y traumatología; tratada con varios analgésicos y fisioterapia fue mejorando paulatinamente del cuadro clínico, siendo dada de alta 6 días después el 24/04. Fue internada de nuevo el día 18/08/23, 5 meses después de la primera internación por dolor intenso de 10 horas de evolución en la región lumbar y los miembros inferiores más del lado derecho que no cedió con medicación analgésica, acompañado de debilidad muscular que se fue incrementando en las horas siguientes hasta impedirle la bipedestación y la deambulación, vomitando en una oportunidad antes del ingreso.

Al examen físico presentaba dolor en la región lumbar y en ambos miembros inferiores, que era más acentuado del lado derecho con irradiación a la parte posterior del muslo y de la pierna derecha siendo positivo el signo de Lassegue, en el miembro inferior izquierdo también presentaba dolor pero de menor intensidad; la debilidad muscular de ambos miembros inferiores no impedía la movilidad, pero le dificultaba sostenerse en pie, siendo el resto del examen físico normal en cuanto al estado de salud y las medidas antropométricas por lo que fue internada con el diagnostico de Lumbociatalgia.

Fue medicada con diversos analgésicos (dipirona, paracetamol, ketorolac) a horario, requirió en varias oportunidadesla administración de morfina e/v, especialmente por las noches debido a los intensos dolores que le impedían conciliar el sueño; días después presentó parestesias en ambos miembros inferiores y anestesia en los dos tercios inferiores de la pierna derecha, conservando sin embargo la sensibilidad térmica y los reflejos osteo- musculares que eran normales en ambos MMII.

La analítica sanguínea realizada fue normal y la nueva RMN que le fue practicada reveló las mismas características que en el estudio anterior de 5 meses atrás, sin alteraciones a nivel del foramen ni del canal medular, por lo cual se descartó cualquier tipo de intervención quirúrgica; a pedido de los neurólogos también se le hizo electromiografía en el MID siendo su resultado normal. Durante su internación había días en que experimentaba cierta mejoría clínica del dolor y de la debilidad muscular, pudiendo en ocasiones permanecer en pie y hasta deambular, para posteriormente en los días siguientes agravarse la sintomatología con dolor intenso más acentuado en el miembro inferior derecho. El examen psiquiátrico reveló que tenía síntomas de ansiedad y ante esta situación confusa y cambiante en una ocasión de dolor intenso por la noche que no cedió con Ketorolac, se le administró como placebo una ampolla de 2 ml de suero fisiológico vía endovenosa, con la cual el "dolor" cedió rápidamente. Ante ésta situación se le comunicó a la madre ese hecho y se le dijo que era probable que el dolor sea somatizado ya que todos los estudios realizados fueron normales con los cuales se descartó una causa orgánica de los síntomas; fue entonces cuando la misma relató que su hija luego del alta de su primera internación presentó varios otros episodios de dolor en la columna y en miembros inferiores, causándole dificultad para mantenerse de pie y deambular, síntomas que motivaron varias internaciones por dos o tres días en el Centro de Salud de su comunidad donde recibía tratamiento analgésico, hecho que le obligaba a no asistir a la escuela de forma regular, lo que a ella no le preocupaba debido a que ya no quería más ir a la escuela porque era motivo de burla y chacota de parte de sus compañeros, inclusive de la propia maestra con quién la niña no tenía buenas relaciones ya desde el inicio de las clases. Cuando se le comunicó a la niña de común acuerdo con la madre que ella iba a mudarse de escuela y que ya no volvería a la anterior, se notó un cambio notable en su estado de ánimo y del cuadro clínico, con el cese total y rápido de la sintomatología clínica, siendo dada de alta el 01/09/23 con el diagnóstico de trastorno neurológico funcional causado por bullying de tipo verbal y se le indicó consulta ambulatoria con el psiquiatra infantil y psicoterapia.

IV. DISCUSIÓN

Pierre Janet ya en el siglo XIX se adelantó a su tiempo, enunciando conceptos de lo que hoy conocemos como las enfermedades psicosomáticas y definió a la histeria como era conocida entonces, como un conjunto de enfermedades por "representación" que es la "conversión", en que la *idea fija* que es un conjunto de pensamientos y recuerdos con una fuerte carga emocional (trauma), que al disociar la conciencia quedan relegados en el subconsciente donde al no ser elaborada se desarrolla y se representa (expresa) en un síntoma físico (7). En 1987 Carlos Gianantonio en una publicación se refería a una "nueva pediatría" al incluir a los problemas psicosomáticos entre las enfermedades, diciendo que se trata de una pediatría totalizadora, que, al comprender la multicausalidad de casi todos los estados de enfermedad y los factores múltiples de los que dependen la salud y el bienestar, incluye en mayor o menor equilibrio, a los parámetros somáticos, emocionales y sociales en todas las acciones (8). Los trastornos somatomorfos o psicosomáticos agrupan diversos cuadros clínicos que cursan con una característica común: la relevancia de los síntomas somáticos vinculados a un malestar psíquico y un deterioro significativo, presentándose tanto en niños y adolescentes, siendo que su frecuencia ha aumentado en las dos últimas décadas (9).

El trastorno conversivo TC, conocido actualmente como trastorno neurológico funcional TNF es un trastorno neuropsiquiátrico que implica interacciones complejas entre el cuerpo y la mente, en la que participan múltiples redes neuronales cerebrales que abarcan una amplia gama de síntomas neurológicos. Los niños con TNF se presentan con síntomas que pueden mimetizar enfermedades neurológicas, en que las más comunes son pseudoconvulsiones y síntomas de tipo motor como parálisis, debilidad muscular y movimientos anormales o también síntomas sensoriales que incluyen parestesias, anestesias, ceguera y sordera, asociados en muchos casos con comorbilidades como ansiedad, depresión, distimia y en varios estudios se encuentra que el componente ansioso es crucial en el desarrollo del TNF (10). La prevalencia del TNF es muy variable y puede ser del 5.4% de las consultas en la clínica neurológica, siendo más frecuentemente afectadas las niñas con una edad promedio de 11 años. En la casuística de 194 niños australianos estudiados por Kozlowska y col. la edad promedio fue de 11 años y las presentaciones más comunes fueron alteraciones de la función motora voluntaria en el 64%, síntomas sensoriales en el 24%, pseudoconvulsiones en el 23% y problemas respiratorios en 14%, requiriendo internación el 70% de los pacientes y que presentaban antecedentes estresores en el 62% de los casos; el estudio también reveló comorbilidad como ansiedad, depresión, siendo factores de estrés "comunes" los conflictos familiares y la pérdida de las figuras de apego (11).

De una revisión total de 85 estudios publicados sobre TNF desde el 2000 hasta setiembre del 2022, que fueron revisados por Radu Stefan Perjoc y col. (12) la incidencia estimada fue de 1.3/100.000 habitantes con un rango entre 1 a 17 casos por 100.000, con alta prevalencia en niñas; encontraron que los agentes estresores estaban presentes entre el 62% al 81%, que está muy por encima de lo que ocurre en la población general.

Aunque podría esperarse que el aumento de la ansiedad relacionada con la pandemia por COVID-19 agravase los síntomas de TNF, no se encontró una clara correlación; la etiología del TNF es compleja y no hay un único mecanismo causal encontrado y hoy la etiología es vista como una compleja combinación de múltiples factores predisponentes más comunes: trauma/síntomas psiquiátricos; síntomas somáticos y factores neurobiológicos (13).

En nuestro país existe poca literatura en niños al respecto, siendo la última publicada por Julio Torales y colaboradores en 2016 (14) El TNF siempre significó para los médicos un gran desafío diagnóstico (15) y el mismo que antes se realizaba por exclusión de otras enfermedades de base orgánica y la presencia de factores psicológicos de acuerdo al DMS-4, se hace ahora según los nuevos criterios del DSM-5 (16), en donde se establecen seis alteraciones que se

categorizan como síntomas somáticos y trastornos asociativos, siendo uno de ellos el TNF y para determinar que el mismo es un trastorno neurológico funcional deben cumplirse las siguientes condiciones: 1) síntomas que alteran la función motora voluntaria o sensorial; 2) hallazgos clínicos incompatibles con una condición neurológica o médica; 3) síntomas que no se expliquen por otro trastorno médico o psiquiátrico y 4) síntomas que causen un significativo distres o dificultad en el funcionamiento social, ocupacional o de otras áreas de funcionamiento (17).

Los niños con el diagnóstico de trastorno neurológico funcional son fácilmente sugestionables y sus síntomas en algunos casos pueden modificarse o desaparecer mediante estímulos externos, describiéndose en algunos "la bella indiferencia" o sea la indiferencia con que son vividos emocionalmente los síntomas por el/a paciente (18).

Según Kozlowska (19) el primer paso en el proceso de evaluación y tratamiento es realizar la evaluación médica/neurológica y que el pediatra, neurólogo, neuropsiquiatra o médico de familia proporcione un diagnóstico positivo de TFN. Los principales avances en la última década han sido reconocer que el TFN es un diagnóstico positivo (en lugar de un diagnóstico de exclusión) y comprender que las interacciones clínicas durante el proceso de evaluación son, en sí mismas, una intervención terapéutica potencialmente valiosa.

En el caso de niños con síntomas motores o sensoriales, el diagnóstico clínico se basa en los signos físicos (positivos) obtenidos durante un examen neurológico. *Ver tabla 1.*

Tabla 1: Signos motores y sensoriales obtenidos del examen neurológico

Síntoma neurológico	**Signo neurológico que el neurólogo puede utilizar para respaldar el diagnóstico de TFN**
A través de los síntomas	Los síntomas son más marcados cuando el niño les presta atención y menos marcados cuando la atención del niño se dirige a otra parte. Los síntomas varían según el contexto (por ejemplo, un niño que presenta pérdida visual puede usar su teléfono móvil pero no puede ver el texto que necesita leer). el aula; la dificultad para caminar del niño está presente cuando camina hacia adelante pero no cuando se da vuelta; el temblor en una
Síntoma neurológico	**Signo neurológico que el neurólogo puede utilizar para respaldar el diagnóstico de TFN**
	extremidad es menor cuando el niño está distraído por el neurólogo)
dificultad para caminar	Una marcha tambaleante o pérdida aparente del equilibrio con una marcha de base estrecha Cada pie se levanta del suelo como si requiriera un gran esfuerzo y se vuelve a bajar como si requiriera un gran esfuerzo El niño camina con las rodillas dobladas (lo que requiere más fuerza que caminar normalmente)
Debilidad (generalizada o parcial)	Discordancia entre la fuerza o la capacidad funcional de la parte del cuerpo afectada del niño en un examen formal y durante las tareas de rutina (p. ej., moverse en la cama del hospital) Debilidad de las extremidades que no se ajusta a una distribución anatómica (p. ej., debilidad de brazos y piernas en lados opuestos del cuerpo)

Temblor	Distribución o frecuencia variable del temblor del niño cuando se examina en diferentes momentos El temblor del niño cambia con los movimientos corporales contralaterales (arrastre)
Síntomas sensoriales (dolor excluido)	Síntomas sensoriales que no se ajustan a una distribución dermatomal. Pérdida hemisensorial con una distribución marcada en la línea media.
Pérdida visual	Visión de túnel Respuesta preservada a un "reflejo de amenaza" (el acercamiento rápido de un objeto)

Los niños con TNF se presentan con un amplio abanico de síntomas diversos que muchas veces son incapacitantes para los pacientes y altamente prevalentes que pueden ser hasta el 14% en la consulta neurológica (20), al inicio se presentan en que las más comunes son convulsiones y síntomas de tipo motor. El tratamiento del TNF en el enfoque biopsicosocial, considerando los factores biológicos, psicológicos, relacionales y escolares que contribuyen a la presentación clínica del niño, con terapia de reentrenamiento y control, terapia cognitivo-conductual y rehabilitación multidisciplinaria (21).

Dada la amplia heterogeneidad de los factores encontrados en los pacientes con TFN, múltiples modelos etiológicos que integran factores psicológicos, físicos y neurobiológicos fueron publicados en los últimos años. Desde el punto de vista neurobiológico se ha descrito un aumento de la conectividad entre los circuitos límbico y motor en los pacientes que afecta los procesos emocionales, la atención, agencia y procesos predictivos.

Los estudios de neuroimagen según D. Pérez y col. (22) indican alteraciones en 4 regiones cerebrales que median la expresión emocional, la regulación y la conciencia (corteza del cíngulo anterior pregenual y corteza prefrontal ventromedial, ínsula, amígdala y vermis), el control cognitivo e inhibición motora (corteza prefrontal dorsolateral, corteza del cíngulo anterior dorsal, giro frontal inferior), el autocontrol, procesamiento autorreferencial y conciencia perceptiva (unión temporoparietal, corteza parietal posterior) y la planificación y coordinación (área motora suplementaria). Ver figura 1.

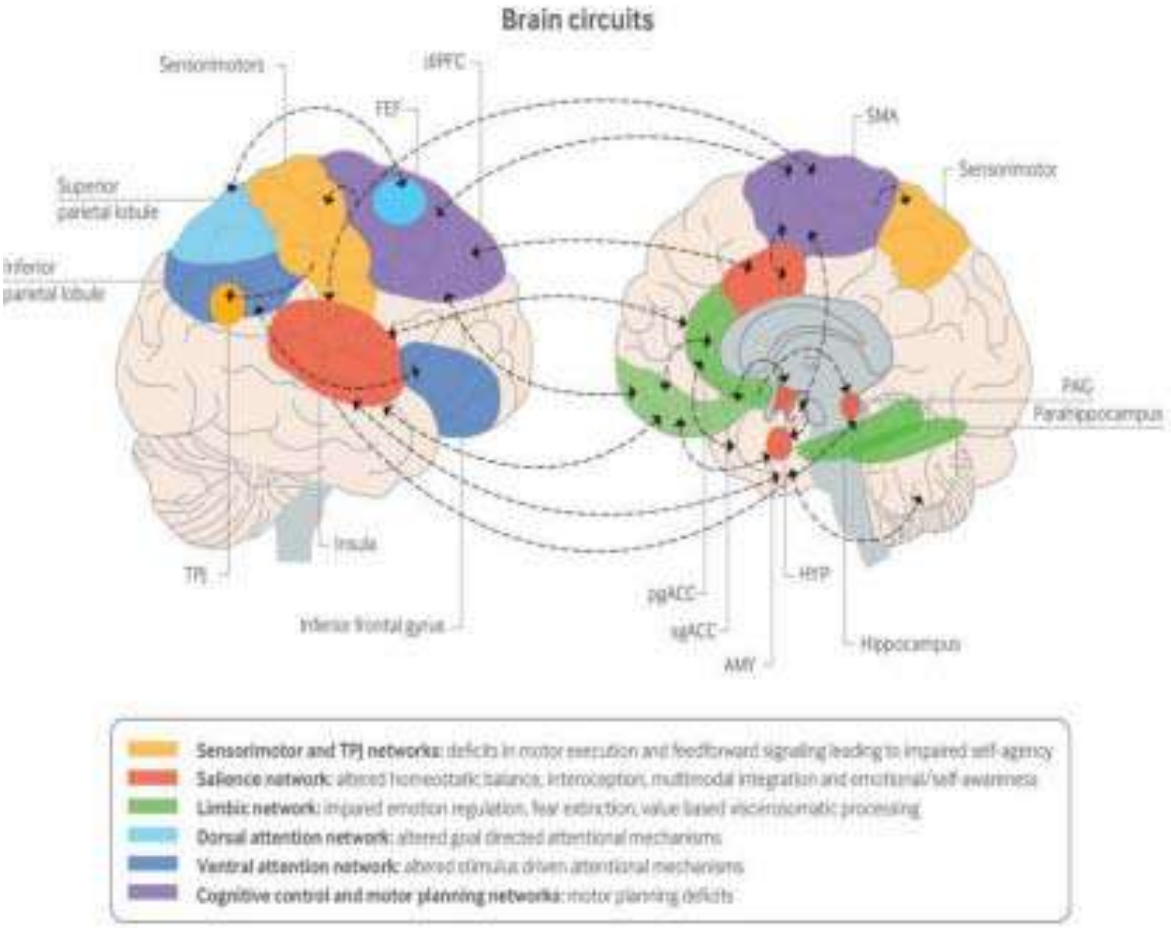

Figura 1: Conexiones neuronales de regiones implicadas en los TFN

Por otra parte el bullying o acoso escolar, que ha sido descrito por primera vez por el psicólogo noruego Dan Olwens en la década del setenta del siglo pasado con una definición sobre el acoso escolar: Un alumno está siendo maltratado o victimizado cuando él o ella está expuesto repetidamente y a lo largo del tiempo a acciones negativas de otro o un grupo de estudiantes, cuyas características son 3: intencionalidad, persistencia en el tiempo y abuso de poder (23). El término bullying proviene del vocablo inglés "bull" que significa toro, por lo que bullying es una actitud de actuar como un toro en el sentido de pasar por sobre el otro u otros, sin ningún tipo de contemplación y se caracteriza por un abuso de poder sistematizado que se puede manifestar a través de distintos tipos de violencia ya sea de forma física, verbal, psicológica, sexual o social, perpetradas en la escuela por uno o más estudiantes contra otro, con los cuales tiene una desventaja en términos de poder y con el claro objetivo de dañarlo, acoso que sólo tiene sentido para el acosador si tiene una audiencia que las aplauda; el bullying físico es el tipo más común, utilizado frecuentemente por el sexo masculino e implica contacto físico manifestado en forma de golpes, empujones o palizas y es considerado la forma más grave; el bullying verbal se caracteriza por el uso de palabras ofensivas como insultos, calumnias, rumores falsos, sarcasmos, apodos despectivos, humillaciones, ridiculizaciones, rumores falsos, injurias, burlas, resaltando diferencias físicas o diferencias sociales y es el tipo de acoso más utilizado por el sexo femenino; el bullying psicológico es el más difícil de detectar y es muy efectivo para dominar con amenazas, intimidación, marginación o exclusión; el bullying social consiste en el rechazo que margina en forma deliberada a la víctima de las actividades en diversas acciones tales como

impedir su participación en el aula, en el patio o en la cancha deportiva, éste tipo de acoso ignora a la víctima como si no existiera; el bullying sexual se manifiesta en forma de asedio involucrando comentarios o actos de naturaleza sexual, tales como referencias malintencionadas a partes íntimas del cuerpo de la víctima o con difusión de rumores de carácter sexual; agregándose en la actualidad una nueva forma de bullying a través de la tecnología, el *cyberbullying* o también *ciberacoso*, con las mismas características del bullying tradicional (24); en una reciente encuesta realizada en nuestro país reveló que 25.5% de los adolescentes de 12 a 18 años reveló haber sido víctima de cyberbullying (25). Se ha descrito un caso de TNF que se presentó como migraña y diplopía causado por cyberbullying (26), Ji Wang y col. han informado que el 20.8 % de los adolescentes estadounidenses sufrieron acoso físico, el 53.6% acoso verbal y el 13.6% cyberbullying (27). Estudios longitudinales que abarca desde los años 1960 a 2015, revelaron que a largo plazo el bullying puede ser el causante de tendencia suicida, psicopatología o criminalidad en la edad adulta (28). Muchos hermanos experimentan algún conflicto ocasional en la familia, sin embargo hasta un 40% están expuestos al acoso entre hermanos cada semana, una forma repetida y dañina de agresión en que la calidad y el comportamiento de los padres son los factores intrafamiliares más fuertemente asociados a ese tipo de acoso, que aumenta el riesgo de verse involucrados en acoso entre pares y se asocia con problemas emocionales como angustia y depresión en la edad adulta (29). El KiVa que viene del acrónimo *Kiusaamista Vastaan* es un programa anti-bullying exitoso que ha sido desarrollado por la universidad de Turku en Finlandia desde el 2006, creado a propuesta del gobierno finlandés y la comunidad educativa, que previene y afronta el bullying con un programa educativo en que los niños "aprendan a vivir juntos", que permitió a los 9 meses de su implementación, los consistentes beneficios de la intervención, gracias a un aprendizaje significativo mediante el respeto entre pares, el cuidado personal y de los demás, que permitió el descenso en 80% el acoso escolar (30). Su éxito es tal, que se ha exportado a otros países europeos e incluso en América latina, siendo el Paraguay uno de los pioneros en algunos colegios de la región,

En el caso relatado la niña cumplía clínicamente los criterios de TNF, ya que los síntomas motores caracterizados por debilidad muscular de miembros inferiores que impedían la bipedestación y la deambulación, conjuntamente con el dolor que inicialmente aparentó ser de tipo lumbociático del miembro inferior derecho de gran intensidad que requirió incluso el uso de morfina en varias ocasiones, acompañándose luego de sensaciones parestesicas en ambos miembros, llegando un día a presentar anestesia en la pierna derecha, síntomas que fueron descartados ser de causa orgánica a través de los estudios analíticos y de imagen realizados que no guardaban relación con el traumatismo anterior. Las alteraciones del cuadro clínico y sus fluctuaciones, caracterizadas por mejoría parcial o empeoramiento alternante de los síntomas en forma inexplicable y la mejoría rápida del dolor en una ocasión con la administración de placebo, hicieron levantar la sospecha de tratarse de un TNF; luego que se pudo determinar que fue víctima de bullying de tipo verbal en su escuela y que ante la promesa de que ya no volvería a la misma donde sufrió el acoso, su mejoría fue completa con la cesación total de los síntomas lo que permitió el alta luego de 11 días de internación.

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Surgical Treatment in Unstable Fractures of the Pelvis and Acetabulum in Children under 3 years

Dr. Cesar Othoniel Gonzalez Cancino

ABSTRACT

The incidence of pelvic fracture represents between 0.5 to 1% of the total hospital admissions for pediatric trauma, in turn the acetabular fracture corresponds to one case per 100,000 children. This low presentation is due to the very special characteristics that this presents. bone segment that allows it to have great elasticity and great tolerance to trauma. We present two patients under three years of age with unstable type IV lesions in the modified classification of Torode and Zieg, who were managed surgically through open reductions and placement of osteosynthesis material. It is impossible to standardize management protocols in this age group, therefore the most appropriate thing is to adhere to pre-established treatment guidelines for skeletally mature people. Our objective is to highlight this type of high-energy injuries that occur with increasing frequency. regularity in very young patients and that on some occasions there will be the need, according to the fracture patterns, to perform the corresponding surgical stabilization to avoid major complications in the short, medium or long term.

Keywords: pelvic, acetabular, fracture, child, surgery.

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SUMMARY

The incidence of pelvic fracture represents between 0.5 to 1% of the total hospital admissions for pediatric trauma, in turn the acetabular fracture corresponds to one case per 100,000 children. This low presentation is due to the very special characteristics that this presents. bone segment that allows it to have great elasticity and great tolerance to trauma. We present two patients under three years of age with unstable type IV lesions in the modified classification of Torode and Zieg, who were managed surgically through open reductions and placement of osteosynthesis material. It is impossible to standardize management protocols in this age group, therefore the most appropriate thing is to adhere to pre-established treatment guidelines for skeletally mature people. Our objective is to highlight this type of high-energy injuries that occur with increasing frequency. regularity in very young patients and that on some occasions there will be the need, according to the fracture patterns, to perform the corresponding surgical stabilization to avoid major complications in the short, medium or long term.

Keywords: pelvic, acetabular, fracture, child, surgery.

I. INTRODUCTION

The incidence of pelvic fracture represents between 0.5 to 1% of total hospital admissions for pediatric trauma, while acetabular fracture corresponds to one case per 100,000 children. The average age of presentation is 11.8 years, with a sex distribution of 46% in girls and 54% in boys. [1-5]

Pelvic fracture, in children with polytrauma, significantly increases morbidity and mortality in them, although pelvic fractures are not common at this age, they are placed second, after traumatic brain injury (TBI), in order of complications. [6]

The rarity of pelvic and acetabular fractures in pediatric patients is often a consequence of the following factors: a large amount of cartilage, a strong ligamentous structure and, above all, significant joint elasticity, which means that the pelvis can absorb a large amount of energy without fracturing. [7-14]

A biomechanical study, presented by Stuhler, shows that forces above 10,000 N in a one-year-old pelvis do not cause fractures, but do cause plastic deformity; In the same way, it has been shown that at ages above 14 years, a force of 3,000-6,000 N is necessary to cause fractures, disruption of the sacroiliac joint or the pubic symphysis. [15]

The most used classifications in pelvic injuries in children are the one modified by Torode and Zieg [16], (Fig. 1) being exclusive for this age group, the Tile classification modified by the AO group and that of Young and Burguess. , while for acetabular fractures there is no one designed for pediatric patients, in this way we can handle the proposal by Judet and Letournel modified by the AO group, but the presence of triradiate cartilage in this area even allows us to use the classification of physeal injuries proposed by Salter and Harris (Fig.2) [17].

Nowadays, fixation of unstable pelvic and acetabular fractures in pediatric patients is widely recommended. Less than 10% of pediatric patients with pelvic injury require surgical management [18-19], even though there is no general consensus on approaches and fixation methods to be used; In the end, the objective will always be to restore pelvic symmetry and periarticular anatomy in the hip, in order to avoid chronic pain, dysmetria in the extremities or gait alterations. [20]

Case 1:

Male patient, 1 year and 7 months old, who entered the pediatric emergency service after being hit by a reversing motor vehicle, presenting injuries on the left side of the body. At the time of evaluation by our service, the presence of abrasive injuries was found. in the abdomen, as well as in the left iliac fossa and crest, Foley catheter with hematuria, and external rotation of the affected pelvic extremity, as well as presence of deformity and increased volume of the left arm, there were no circulatory or alertness alterations (Fig . 3).

Admission laboratories: Hemoglobin 8 gr/dl, Leukocytes 6,180, neutrophils 43.6, platelets 178,000, Creatinine 0.32, Uric acid 5.9.

Negative FAST was reported, left pleural effusion, left peritoneal slide with little 2.1cc fluid, bladder with regular edges and contours, thin wall 1.5mm, semi-solid hyperechoic image floating inside suggestive of a clot.

The plain x-ray of the pelvis showed: loss of bone continuity at the level of the undisplaced right ileopubic and ischiopubic ramus, and left iliopubic ramus with superior displacement of 2cm (Fig. 4). The computed axial tomography (CT) confirmed pelvic ring injuries with complete avulsion of the iliopubic ramus on the left side, which involved injury to the growth cartilage of the ipsilateral hip with significant rotation thereof. (Fig. 5)

Based on the modified classification of Torode and Zieg, this pelvic injury corresponds to type III A, but the involvement of the triradiate cartilage involves the acetabulum, therefore, we consider this fracture as a combined injury of the pelvis and acetabulum. Now classified as a type IV; For this reason, surgical stabilization was proposed, and an anterior Ilioinguinal approach was performed with the use of the first and third windows only, where we reduced the avulsion and displacement of the iliopubic ramus with a spike ball, and stabilized with a 3.5 reconstruction plate. millimeters of 6 holes and three cortical screws of 3.5 millimeters, we obtained a satisfactory reduction and stabilization (Fig. 6); During the intervention we detected a bladder injury which was repaired primarily by the urology service and managed with the use of a Foley catheter for a couple of weeks. This was resolved without any problem, the patient's evolution was satisfactory, there were no complications. some, started ambulation at eight weeks without restrictions, the osteosynthesis material was removed at eight months, the punctual follow-up was until 18 months, after this time he was discharged from the service (Fig. 7).

Case 2:

Female patient, 2 years and 1 month old, who entered the pediatric emergency service after being run over and ejected by a motor vehicle, presenting after the event deformity in the left pelvic extremity and severe pain in the suprapubic region, without loss of alertness. She is referred to the hospital for emergency care.

Clinically, in the evaluation carried out by our service, we observed dysmetria in the lower extremities at the expense of the left side, as well as some dermabrasions in the left hemipelvis and a slight increase in volume in the genitals (Fig.8).

Admission laboratories: Hemoglobin 10.1 gr/dl, Leukocytes 12,440, neutrophils 52.9, platelets 240,000, Glucose 103 Urea 34.67 Creatinine 0.39.

The simple x-ray of the pelvis showed: significant opening at the level of the pubic symphysis, loss of joint congruity of the left hip with displacement of the femoral head and apparently opening at the level of the ipsilateral sacroiliac joint (Fig. 9). In the computed axial tomography (CAT) we observed in detail the injury at the level of the left sacroiliac joint which corresponds to a crescent fracture injury. (Fig. 10 and 11).

In the modified classification of Torode and Zieg, the pelvic injury corresponds to a III B injury, but with accompanying hip dislocation it becomes a type IV injury according to the proposed criteria. For this reason, surgical stabilization was carried out through an anterior ilioinguinal approach using the first and third windows in the same way as in the previous case, reducing the pubis with a field-type clamp and fixing it with a 3.5 4-hole plate. millimeters with the corresponding screws, in the same way two 3.5 millimeter 2-hole

reconstruction plates were placed in the sacroiliac lesion, ending with the open reduction of the femoral head and fixation of the femoral epiphysisolisthesis, with a 4.0 cannulated screw. millimeters (Fig. 12 and 13), a plaster device was placed to keep the affected hip immobilized, the evolution was satisfactory until two months when dislocation of the left hip occurred (Fig. 14), which is why it was proposed new surgical management, which was not accepted by the patient's relatives due to the idiosyncrasy of those who decided on empiric management and unfortunately we lost follow-up despite multiple attempts to contact them and we do not know the current status of the patient .

II. DISCUSSION

The multiple classifications of pelvic fractures still have biases today, for example, the original classification of Torode and Zieg, divides fractures into stable and unstable, but makes no difference between the type of fracture and degree of instability, which with the The most recent modification has tried to correct this problem, Tile and Pennal (AO), combine mechanism of injury and degree of pelvic instability, but it is difficult to adapt them to the pediatric age. At the same time, there is no specific classification for acetabular fractures in children, and it is most common to use the Salter and Harris classification for this purpose. Bucholz in 1982 [17] presented a work with a series of cases of patients with acetabular fractures and observed The most frequent lesions of the triradiate cartilage would be type II and V of Salter and Harris, with type V being the most severe, due to the closure of the physis that it can cause.

Generally, in pelvic fractures in children, the idea is to adhere to the management algorithms established for adults, although in reality they behave like different entities; where always initially, efforts are made to maintain hemodynamic stability to preserve life and once this situation is resolved, proceed to assess the biomechanical stability of the injury. The Tile and Pennal type A injury is normally managed conservatively and in type B or C (III B with displacement greater than 2 millimeters and unstable IV by definition in the modified classification of Tored and Zieg) must be surgical. [21-22]

With regard to acetabular injury, this is even more difficult to rule; Salter and Harris type I and II injuries, with minimal displacement, can be managed conservatively, since there is no evidence that they alter growth, on the other hand. On the other hand, acetabular injuries that result from an incongruity between the femoral head and the acetabulum must be surgical.

Anterior ring injuries can normally be treated with external fixation, or direct repair of the injured bone using nonabsorbable sutures, as well as with the use of plates and screws. [23-24] The standard approach for this type of repair is the ilionguinal approach, proposed by Letournel; Likewise, on some occasions depending on the personality of the fracture, the Smith Petersen approach can be used.

Posterior arch injuries normally involve the sacroiliac joint and in this sense we can use iliosacral screws, bone sutures and in very rare cases lumbopelvic fixation systems that have been modified to treat young patients with immature skeletons. [25] Fixation is normally carried out through the traditional ilionguinal approach or in one of its windows or in the case of iliosacral screws, the technique widely described for this purpose.

In acetabular fractures, there are priority management options, such as keeping the head reduced or reducing it as soon as possible if it is dislocated and the management of injuries to the triradiate cartilage; If these are not displaced, they can be managed conservatively as the case may be, but injuries with significant displacement must be reduced as anatomically possible. The surgical indications for acetabular fractures in children are[26]: the inability to maintain the congruity of the femoral head, joint displacements greater than 2 millimeters, joint fragments trapped in the joint, open fractures, and fractures associated with an unstable pelvis, the commonly used surgical approaches are the Kocher Lagenbeck type approach for the posterior approach and the Ilioinguinal approach for the

anterior approach, The use of a modified stoppa approach has been reported casually[7].

Large series with acetabular fractures practically do not exist. Bucholz's case series [17] consisted of 9 cases, only one of which was surgical. Letournel published a series of 5 cases of triradiate cartilage injury managed with internal fixation [27]. Slongo published a series of only 19 cases. [28]

Trousdale and Ganz [29] found that injuries at a young age, 5 years or younger, with closure of the physis are more likely to result in posttraumatic dysplasia, whereas injuries in adolescence tend not to develop acetabular dysplasia. Although premature arthritis is unlikely in a child, it is possible that traumatic dysplasia or other bone growth abnormalities could develop a propensity for early post-traumatic arthritis in a young adult. [1]

In pelvic injury, normal function is expected to be recovered within 6 months, understanding that an anatomical reduction will lead to excellent results, unlike an unstable pelvis fused in an incorrect position with lifelong functional problems.

In acetabular injury, obviously the injury to the triradiate cartilage can have serious consequences, such as a dysplastic acetabulum with an unstable hip and the consequent early osteoarthritis as mentioned previously.

III. CONCLUSION

The rarity of this type of injuries in the pediatric population, coupled with not being able to have a clear vision of the real limits between conservative or surgical management and the multiple pathologies that may be associated, make it very difficult to standardize management guidelines.

Hence the importance of individualizing each case, assessing and defining the stability or instability in pelvic injuries or the degree of involvement or deformity of the acetabular anatomy with or without injury to the growth cartilage.

In this pair of cases that we present, they were severe injuries that undoubtedly warranted surgical management, we did not find any literature, there is practically no information on the surgical management of patients with injuries to the pelvis and acetabulum at ages younger than 3 years, since Normally, these types of injuries, which are initially rare in pediatric patients, tend to occur in much older children.

In the first case the evolution so far has been excellent without complications; Unfortunately, in the second of them we had a coxofemoral dislocation two months later and we did not have the opportunity to correct this situation or have the patient follow up.

The final objective of this article is to emphasize the correct identification and diagnosis of pelvic instability or acetabular injury in the pediatric patient with polytrauma and from theremake use of the various therapeutic tools available to try to obtain the best possible results and avoid future consequences.

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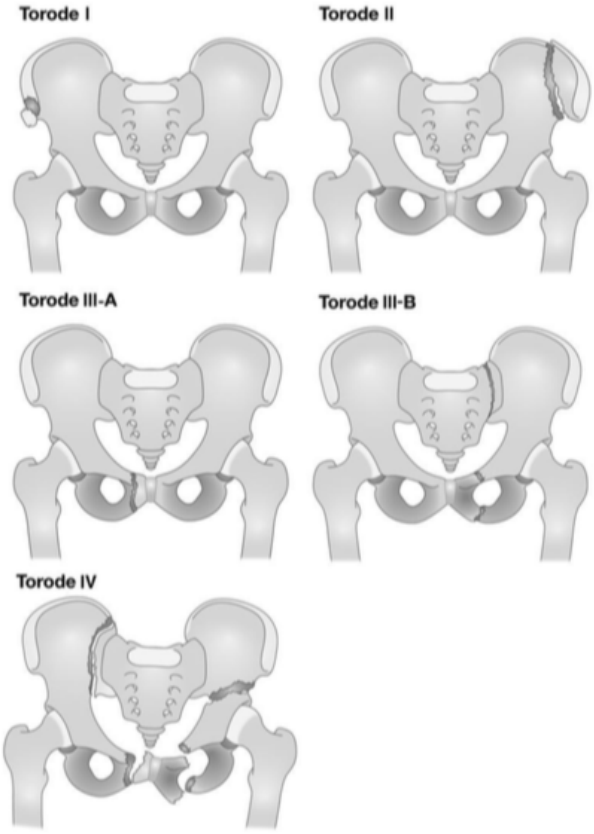

Fig. 1: Modified Torode and Zieg classification: Torode I (avulsion fractures): avulsion of the bony elements of the pelvis, invariably a separation through or adjacent to the cartilaginous growth plate. Torode II (iliac wing fractures): resulting from a direct lateral force against the pelvis, causing a rupture of the iliac process or an inwardly folded fracture of the ilium wing. Torode III-A (simple anterior ring fractures): This group included only children with stable anterior fractures involving the pubic rami or pubic symphysis. Torode III-B (stable anterior and posterior annulus fractures): This new group involved children with stable anterior and posterior annulus fractures. Torode IV (unstable annular rupture fractures): This group of children had unstable pelvic fractures, including annulus ruptures, hip dislocations, and combined pelvic and acetabular fractures.

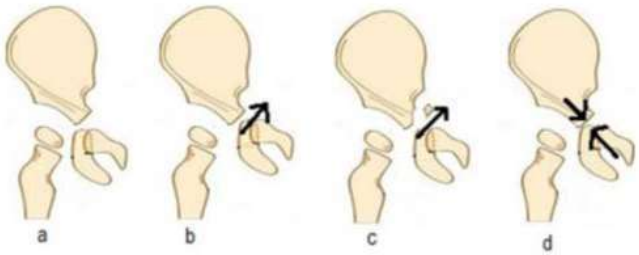

Fig. 2: Classification of acetabulum fractures based on the Salter and Harris classification. a) normal acetabulum, b) type I injury, c) type II injury d) type V injury

Fig. 3: Clinical presentation of dermoepidermal lesions in the pelvic area

Fig. 4: Anteroposterior radiograph of the pelvis with significant displacement of the left iliopubic ramus

Fig. 5: Computed axial tomography (TAC), where we appreciate the rotation of the fragment of the iliopubic ramus and the involvement of the triradiate cartilage

Fig. 6: Anteroposterior radiograph of the pelvis, where we can see the adequate reduction of the acetabular lesion

Fig. 7: Patient status after one year of follow-up

Fig. 8: Clinical presentation of pelvic lesions with shortening of the left pelvic extremity

Fig. 9: Anteroposterior radiograph of the pelvis showing pubic diastasis, coxofemoral dislocation with epiphysiolisthesis of the femoral head

Fig.10: Computed axial tomography of the pelvis (TAC), where the crescent fracture type lesion at the sacroiliac level can be seen in detail

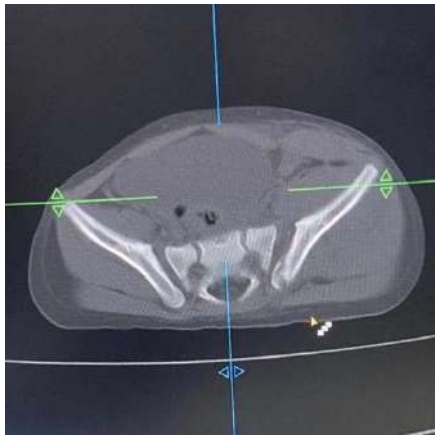

Fig. 11: Coronal section of computed axial tomography, where we can see the diastasis at the level of the sacroiliac joint and a segment of the iliac joint still attached to the joint

Fig. 12: Approach to the hip to reduce femoral epiphysiolisthesis and coxofemoral dislocation

Fig.13: Anteroposterior radiography of the pelvis after surgical stabilization

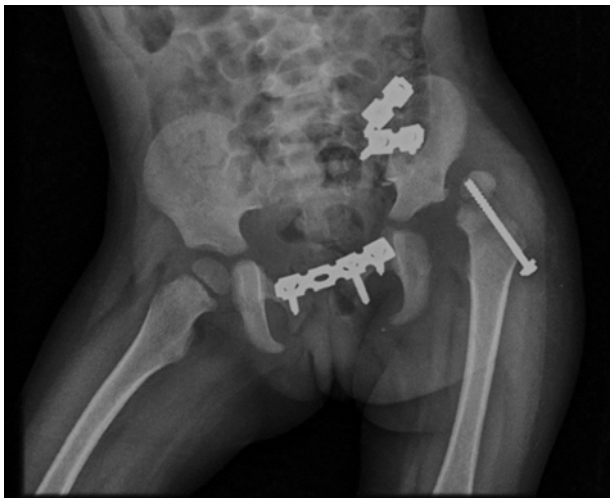

Fig. 14: Anteroposterior radiograph of the pelvis after two months of follow-up with hip dislocation on the left side

Once Treatment Successfully Corrected a Pregnant Malposition by the Crouch Lying Following the Moxibustion Immediately

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ABSTRACT

This essay reports a case achieved by combining the two traditional methods of correcting pregnant malposition, the crouch lying and the moxibustion, into once process. Firstly, take a moxibustion to the pair of acupoints 'Zhiyin xue' of the gravida, then, let her immediately change to lie facing downward as a crouch style for minutes waiting for hearing the voice of the fetus turning action. It successfully corrected the malposition in once treatment.

Keywords: pregnancy, correction of malposition, moxibustion, zhiyin xue, crouch style lying, one treatment.

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ABSTRACT

This essay reports a case achieved by combining the two traditional methods of correcting pregnant malposition, the crouch lying and the moxibustion, into one process. First, take a moxibustion on the pair of acupoints, which are named 'Zhiyin xue' in the Chinese traditional medicine (CTM), of the gravida, then, the gravida immediately change to lie facing downward as a crouch for minutes waiting for the fetus turning action. This successfully corrected the malposition as once treatment.

Keywords: pregnancy, correcting malposition, moxibustion, zhiyin xue, crouch lying, one treatment.

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I. INTRODUCTION

Both methods of the crouch lying and the moxibustion for correcting pregnant malposition are influential and popular in the Chinese traditional medicine (CTM). However, they are usually described as two separated methods in books [1], even the same as it goes on so far [2, 3].

This essay reported a way of combining the two methods into one process as a successful case.

II. CASE REPORT

It was in spring of 1970, the couple of Jianmin Jiang (JM) worked as meteorologists and lived in the Wulumuqi city in the Northwest of China, when Yuyong Jiang (YY) was a fetus, but in a malposition – breech position, her head was opposite in an upper position. This made JM's couple very anxious. As you well known, it is usually in danger to be treated a caesarean section during the childbirth process, as in the Western medicine. Thus, JM looked round if there is a possibility to avoid them from any caesarean section via the CTM. Unfortunately, he could not find any suitable doctor to do it on those days because of living in a place far from hospital.

One Sunday, JM visited a book store of 'Xinhua Shudian' and happened to see a book titled <Hand Book for 'Barefoot' Doctors> [1], he glanced at the book's content, then was surprised to find the page, on which the text of correcting pregnant malposition appears. He start to read carefully, it was written (Fig. 1) as followings:

[Precautions][1]

1. When a breech position of malposition is diagnosed (Fig. 1, left), after seven months of the pregnancy, the gravida may take a face downward as a crouch lying with loosening her waistband, i.e. relies on her kneels and cephalothorax to exert herself body (as shown in the right 14-26 of Fig. 1) for 15 minutes to help the fetus invert naturally. To perform twice per day.

Figure 1: The page that JM read and marked in 1970 after YY came out to the world usually (Copied From [1], p480)

2. Take a moxibustion on the pair of acupoints named 'Zhiyin xue', i.e. the 'BL67' in the CTM[4]. The pair of 'Zhiyin xue' locate at the outsides of the little tiptoes (Fig. 2,)[4, 5]. To perform a moxibustion for 15 minutes per day.

Fig. 2: The red point is the Zhiyin xue (From [5])

JM considered over that we have to do it following these instructions by our self as an experiment any way. Perhaps, we may try to combine the two methods above mentioned onto one process to add more confidence. Under this consideration, JM bought a pair of Chinese mugwort sticks, and waited till the date of the pregnancy in full seven months. The couple tried to treat in an afternoon as following steps:

The fetus's mother, the gravida, loosed her waistband after a micturition, then she lied facing upward on bed with her crus and foots drooping down along the side of the bed. JM set a fire to the pair of Chinese mugwort sticks, handed the pair of fired sticks in each hand, put them around 30 cm below the gravida's left and right little tiptoes, where the 'Zhiyin xue' locate in, let the gravida feel warm on her pair of little tiptoes, kept for about 10 minutes, so that the gravida felt warming enough, then, JM moved very slowly the two fired mugwort sticks in his hands from lower to upper to close the gravida's little tiptoes, till she felt a little hot being uncomfortable at her little tiptoes. That was over to finish the treatment of method (2) firstly. Followed by performing the method (1).

YY's mother immediately changed to lie facing downward with a kneeling, so that let her breech higher than her cephalothorax alike as shown in

Figure 1: 14-26. Just kept for a few minutes, she said that a voice of "gudu" was suddenly sounded, and felt that the fetus acted an inverse in her abdomen. Thus, we reached a victory in the case of combining moxibustion and crouch lying in the CTM!

"The malposition was successfully corrected!" the diagnostician said on the next day. The whole family was very delighted upon this once treatment!

On her birthday, YY came out to the world usually! She graduated from the Beijing University of Chinese medicine in 1993, and received her PhD after then. This is a lucky story in our lifetime indeed.

As we found now that above report might be, perhaps, somewhat an improvement or difference from that described in the quoted books [1-3] and being introduced online nowadays [6]. It is just the reason why we attempt to submit this report here. Perhaps, this case report might help someone, such as a pregnant lady who suffers from the malposition, or a doctor who curs the malposition pregnancy more effectively, so that the gravida can be prevented from a caesarean section, which is usually treated in the Western medicine.

III. SUMMARY MARK

This case report might suggest three necessary treatment steps: ① The moxibustion is treated synchronously to the pair of acupoints, the 'Zhiyin xue' first; ② Treating to warm the pair of acupoints enhancing slowly till start to feel a little hot being uncomfortable; ③ The gravida immediately change to a crouch lying, so that her breech higher than her cephalothorax for minutes to wait for the correction of pregnant malposition. These are somewhat different from the instruction in the quoted books [1-3] and online webs [6].

This is just one case with a surprised success. It is needed to be verified by more cases studies. Perhaps, such as needing to give more times than once treatment sometime, or, being suitable to cur parts of the pregnant malposition in practices.

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