

ORIGINAL ARTICLE

Depression Among School-Age Children Performing Clean Intermittent Catheterization (CIC) In Neurogenic Bladder

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ABSTRACT

Introduction: Neurogenic bladder (NB), often due to spinal conditions, impairs bladder emptying and can lead to chronic kidney disease (CKD) and recurrent urinary tract infections (UTIs). Clean intermittent catheterization (CIC) is used to manage bladder emptying but can present physical and emotional challenges, particularly for children. This study investigates the relationship between pain during CIC and depression in these children to understand paediatric mental health in chronic illness. **Methods:** This cross-sectional study included children aged 7 to 18 years with NB who performed CIC, recruited from two tertiary hospitals. Data included age, sex, family income, and CIC duration. Depression was assessed using the Malay-translated Children Depression Inventory (CDI), and pain perception during CIC was evaluated with the Wong-Baker FACES Rating Scale (WBFS). Chi-square, and Fisher's exact tests analyzed depression associations. **Results:** 72 children participated, with a mean age of 11.68 years (SD = 3.27); 54.2% were female. Myelomeningocele was the most common cause of NB (45.3%), and hydronephrosis was the most common kidney complications (44.4%). Depression was reported in 31.9% of children. Pain experiences varied: 41.7% had no pain, 37.5% had mild pain, 19.4% had moderate pain, and 1.4% had severe pain. No significant association between pain and depression was found. However, depression was significantly associated with hydronephrosis ($p = 0.003$). No other variables were significantly associated with depression. **Conclusion:** Pain during CIC was not linked to higher depression scores in children with NB, though more than half reported some pain. Hydronephrosis was the only factor significantly associated with depression.

Malaysian Journal of Medicine and Health Sciences (2026) 22(SUPP2):79-86. doi:10.47836/mjmhs.22.s2.11

Keywords: Pediatric, Neurogenic bladder, Clean intermittent catheterization, Depression

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INTRODUCTION

Neurogenic bladder (NB) can result from congenital anomalies like myelomeningocele and diseases that damage the central, peripheral, or autonomic nervous systems. Complications from bladder dysfunction may lead to progressive renal damage, urinary tract infections (UTIs), as well as psychological and social sequelae related to urinary incontinence (1). A proactive management approach involves early diagnostics, imaging, urodynamic (UDS) evaluations, and timely initiation of clean intermittent catheterization (CIC), with pharmacotherapy or surgery if indicated (2). CIC is a pivotal intervention for managing voiding issues in neurogenic, providing a systematic approach to periodic bladder emptying through catheter insertion (3). This technique allows for periodic bladder emptying

at routine intervals by inserting a catheter through the urethra, emphasizing hygienic practices with disposable or cleansed reusable catheters (4,5). CIC should be initiated early in life for children diagnosed with NB. Furthermore, strict compliance with hygiene protocols during CIC, along with its proven effectiveness, helps restore normal urinary tract function and reduces complications such as urinary tract infections (UTIs), vesicoureteral reflux (VUR), and renal scarring (6–8). Despite its benefits, frequent CIC can lead to complications such as urethritis, epididymitis, and urethral meatal stricture (9). Catheterization in patients with NB may lead to misinterpretation of the perception of pain due to disrupted sensory pathways from nerve damage affecting normal bladder function and sensation (10). Furthermore, pain perception during the performance of CIC has not been thoroughly explored in the literature as a related complication. This oversight is noteworthy, as pain, an unpleasant sensory and emotional experience (11), is often associated with anxiety and depression (12,13).

The complex interplay between chronic illness and mental health highlights the significant impact of conditions like anxiety and depression on various domains of functioning, including work performance, social functioning, and overall health (14,15). Depression represents a prevalent and consequential comorbidity associated with chronic illnesses in the adult population, significantly affecting medical morbidity (12,16). Depression can adversely affect the prognosis of chronic medical conditions, leading to poorer health outcomes, increased disability in chronic pain conditions, reduced quality of life, and increased healthcare costs due to more frequent service use (17–19). While epidemiological studies have highlighted the increased susceptibility to psychological disorders in children with chronic conditions, comprehensive research on paediatric depression remains limited (17). The ramifications of depression extend beyond individual well-being, affecting social relationships, increasing suicide risk, and potentially leading to long-term health consequences for children and adolescents dealing with chronic illnesses (20,21). Understanding the factors predisposing chronically ill children to depression is crucial for addressing mental health challenges within paediatric populations. Therefore, a thorough examination of the multifaceted factors contributing to psychological distress in this vulnerable demographic is necessary for effective intervention.

This study aims to investigate the intricate relationship between depression and school-age children undergoing CIC for NB, aiming to unravel the nuanced dynamics between chronic illness of NB and potential depression associated with the disease, as these factors may impact the overall outcome of the illness. By elucidating these complexities with scholarly rigor, the research aims to advance our understanding of paediatric mental health within the context of this chronic illness, ultimately informing holistic care approaches that optimize outcomes and nurture resilience in this vulnerable paediatric cohort.

MATERIALS AND METHODS

This was a cross-sectional study conducted among school-age children with NB performing CIC at two major tertiary hospitals in Kelantan, covering the period from March 2023 to February 2024. Ethical approval was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/22070469) and the Medical Research Ethics Committee of the Ministry of Health (MOH) Malaysia (NMRR ID-23-01817-0UW (IIR)). The participants were school-age children aged 7 to 18 years with NB who had been using CIC for at least one year. The exclusion criteria included participants who were unable to complete the questionnaire due to poor literacy and command of the Malay language, as well as children with intellectual disabilities or organic brain syndrome.

The target sample size was calculated using two independent means (based on the detectable difference) with an expected effect size of 0.55, an α error of 0.05, a power of 0.8, and an estimated dropout or outlier rate of 10%. The total sample size is 72.

This study employed a self-administered questionnaire. Following informed consent, a validated Malay-translated Children's Depression Inventory (CDI) a self-rated inventory, was used to assess participants' depressed mood, consisting of five factors: negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative symptoms (22). The CDI includes 27 items, each offering three response choices that reflect the child's feelings over the previous two weeks. The scores from these items were summed to produce a total depression score ranging from 0 to 54, where higher scores denote a greater level of depression. Participants scoring 15 or higher were classified as depressive (23).

Pain perception during performing CIC was assessed using the Wong-Baker FACES Rating Scale (WBFS), which uses six facial expressions to categorize pain levels into four categories: no pain, marked by a score of 0; mild pain, scored between 1 and 3; moderate pain, ranging from 4 to 6; and severe pain, encompassing scores from 7 to 10 (24).

The data collected were analysed using Chi-square tests and Fisher's exact test analysis utilized to analyze the relationship between depression and selected demographic as well as disease-related variables.

RESULTS

A total of 125 potential participants were initially identified, comprising 108 from Hospital Universiti Sains Malaysia (Hospital USM) and 17 from Hospital Raja Perempuan Zainab II (HRPZ). Following the application of established inclusion and exclusion criteria, 41 participants from Hospital USM and 12 from HRPZ II were excluded. Exclusion reasons included not fulfilling the age group criteria, not performing CIC for at least one year, having an intellectual disability or organic brain syndrome, or being unable to complete the questionnaire due to poor literacy. Consequently, the study achieved a final sample size of 72 eligible participants ($N = 72$). The mean age of the participants was 11.68 years ($SD = 3.27$). There was a slight predominance of females (54.2%) over males (45.8%). The racial composition was predominantly Malay (90.3%), with very few children from other racial backgrounds. Most families belonged to the B40 income group (56.9%). The majority of children attended mainstream schools (76.4%) (Table I).

The median age at diagnosis of NB was 1 month ($IQR = 32.00$), with the minimum age being 1 month and the maximum age being 108 months. The median age at

Table I: Demographic information on school-aged children performing CIC in the neurogenic bladder (N = 72)

| | n (%) | Mean (SD) |
|--------------------------------|-----------|--------------------------|
| Age | | 11.68 (3.27) |
| 7 – 12 years old | 38 (52.8) | |
| 13 – 18 years old | 34 (47.2) | |
| Gender | 33 (45.8) | |
| Male | 39 (54.2) | |
| Female | | |
| Race | | |
| Malay | 65 (90.3) | |
| Chinese | 6 (8.3) | |
| Indian | 1 (1.4) | |
| Family income (per month) * | | 2650 (3188) ^a |
| B40 | 41 (56.9) | |
| M40 | 24 (33.3) | |
| T20 | 7 (9.7) | |
| Type of School | | |
| Mainstream School | 55 (76.4) | |
| Special Education Class | 7 (9.7) | |
| Community-Based Rehabilitation | 9 (12.5) | |
| Not Schooling | 1 (1.4) | |

CIC – Clean Intermittent Catheterization SD – Standard deviation.

* Department of Statistics Malaysia (DOSM) Household Income and Expenditure Reports

2019 B40 – household income < RM 3,030,

M40 – household income RM 3,030 – RM6,619, T20 – household income > RM 6,620.

a – Median (Interquartile range (IQR))

which CIC was initiated was 1 month (IQR = 47.00), with the minimum age being 1 month and the maximum age being 120 months. Most children (n = 66; 91.7%) performed CIC four or more times per day, while only 8.3% performed CIC 1–3 times per day. Individuals performing CIC were nearly evenly divided between self-care (47.2%) and caregiver assistance (52.8%). In this study, there were superimposed comorbidities in the same participants, such as hydrocephalus and myelomeningocele. Most children (76.4%) were capable of walking independently, even though myelomeningocele was the predominant comorbidity (45.3%). Additionally, there were superimposed comorbidities such as vesicoureteral reflux (VUR) and recurrent urinary tract infections (UTIs). The most common complications identified in the cohort included hydronephrosis (44.4%), followed by VUR (29.2%), recurrent UTIs (12.5%), kidney failure (12.5%), urinary calculi (1.4%), and no complications (20.8%) (Table II).

The data presented in Figure I demonstrated that approximately 31.9% of participants are categorized as depressed based on their CDI scores, indicating that nearly one-third of the children in the study experience symptoms of depression.

Table III illustrated that 41.7% of these children report experiencing no pain during the CIC procedure, followed by mild pain, moderate pain, and severe pain (proportions of 37.5%, 19.4%, and 1.4%), respectively. The Pearson's chi-square test and Fisher exact test analysis in Table IV showed no significant differences in demographic data, suggesting that depression levels were not significantly affected by these variables. The proportions of children with lower and higher

Table II: Disease-related variables in children performing CIC in neurogenic bladder (N = 72)

| | n (%) | | Median (IQR) |
|---------------------------------------|-----------|-----------|---------------------------|
| Age at diagnosis (month) | | | 1.00 (32.00) |
| Age starting CIC (month) | | | 1.00 (47.00) |
| Size of catheter used during CIC (Fr) | | | 10.25 (1.77) ^a |
| Frequency using CIC | | | |
| 1 – 3x/day | 6 (8.3) | | |
| ≥ 4x/day | 66 (91.7) | | |
| Person performing CIC | | | |
| Self | 34 (47.2) | | |
| Caretaker | 38 (52.8) | | |
| | Yes | No | |
| Able to walk independently | 55 (76.4) | 17 (23.6) | |
| Comorbidity ^b | | | |
| Hydrocephalus | 21 (29.2) | | |
| Meningocele | 4 (5.6) | | |
| Myelomeningocele | 33 (45.3) | | |
| Lipomyelomeningocele | 12 (16.7) | | |
| Spinal cord tethering | 9 (12.5) | | |
| Sacral agenesis | 7 (9.7) | | |
| Neoplasm | 2 (2.8) | | |
| Transverse myelitis | 4 (5.6) | | |
| Presence of VP shunt | 21 (29.2) | | |
| Complication ^c | | | |
| Vesicoureteral reflux | 21 (29.2) | | |
| Hydronephrosis | 32 (44.4) | | |
| Urinary calculi | 1 (1.4) | | |
| Recurrent UTI | 9 (12.5) | | |
| Kidney failure | 9 (12.5) | | |
| No Complication | 15 (20.8) | | |

VP – ventriculoperitoneal

UTI – Urinary tract infections.

IQR – Interquartile range

a – Mean (Standard Deviation), catheter size in French (Fr)

b – There are superimposed comorbidities in the same participants, such as hydrocephalus and myelomeningocele

c – There are superimposed comorbidities in the same participants, such as Vesicoureteral reflux (VUR) and recurrent urinary tract infections (UTI)

depression scores were relatively balanced across these factors, indicating no strong patterns in how these variables influence depression. There were no significant associations between depression and most disease-related variables in school-age children with NB undergoing CIC. However, the chi-square test results

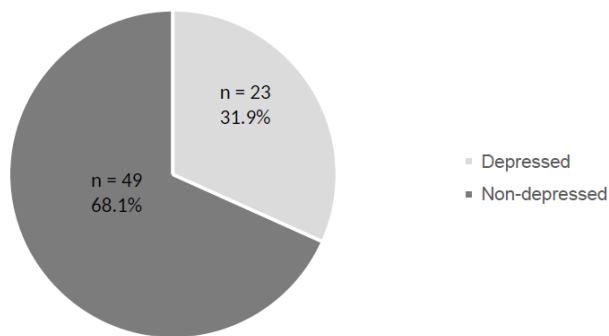


Figure 1: The CDI score of school-aged children performing CIC in neurogenic bladder

CDI – Children’s Depression Inventory
 CIC – Clean Intermittent Catheterization,
 Depressed – CDI score ≥ 15,
 Non-Depressed – CDI score < 15.

Table III: Pain perception severity in school-aged children with neurogenic bladder during CIC

| Severity of pain while performing CIC in neurogenic bladder n (%) | |
|--|-----------|
| No pain | 30 (41.7) |
| Mild pain | 27 (37.5) |
| Moderate pain | 14 (19.4) |
| Severe pain | 1 (1.4) |

CIC - Clean Intermittent Catheterization,
 Wong-Baker FACES Rating Scale (WBFS) categorized: no pain (score: 0), mild pain (score: 1 – 3), moderate pain (score: 4 – 6), and severe pain (score: 7 - 10).

Table IV: The association between selected demographic and disease-related variables in school-aged children with neurogenic bladder performing CIC with depression

| Categories | Depression* | | χ^2 (df) | p |
|--------------------------------|---------------|--------|---------------|--------------------|
| | Non-depressed | | | |
| | n | (%) | | |
| Gender | | | 0.55(1) | 0.459 ^a |
| Male | 21 | (63.6) | | |
| Female | 28 | (71.8) | | |
| Age | | | 0.33(1) | 0.564 ^a |
| 7–12 years old | 27 | (71.1) | | |
| 13–18 years old | 22 | (64.7) | | |
| Race | | | - | 0.673 ^b |
| Malay | 45 | (69.2) | | |
| Others | 4 | (57.1) | | |
| Type of school | | | - | 0.377 ^b |
| Main stream School | 39 | (70.9) | | |
| Special Education Class | 5 | (71.4) | | |
| Community-Based Rehabilitation | 5 | (55.6) | | |
| Not Schooling | 0 | (0) | | |
| Family income | | | 0.98(2) | 0.614 ^a |
| B40 | 26 | (63.4) | | |
| M40 | 18 | (75) | | |
| T20 | 5 | (71.4) | | |
| Person performing CIC | | | 1.17(1) | 0.279 ^a |
| Own | 21 | (61.8) | | |
| Caretaker | 28 | (73.7) | | |
| Frequency using CIC | | | - | 0.078 ^b |
| 1–3 x/day | 2 | (33.3) | | |
| ≥4 x/day | 47 | (71.2) | | |
| Able to walk independently | | | 0.07(1) | 0.798 ^a |
| No | 12 | (70.6) | | |
| Yes | 37 | (67.3) | | |
| Hydrocephalus | | | 0.26(1) | 0.871 ^a |
| No | 35 | (68.6) | | |
| Yes | 14 | (66.7) | | |
| Meningocele | | | - | 0.588 ^b |
| No | 47 | (69.1) | | |
| Yes | 2 | (50) | | |

Continue.....

Table IV: The association between selected demographic and disease-related variables in school-aged children with neurogenic bladder performing CIC with depression (continued)

| Categories | Depression* | | χ^2 (df) | p |
|----------------------------|---------------|--------|---------------|--------------------|
| | Non-depressed | | | |
| | n | (%) | | |
| Myelomeningocele | | | 1.56(1) | 0.212 ^a |
| No | 29 | (74.4) | | |
| Yes | 20 | (60.6) | | |
| Lipomyelomeningocele | | | - | 0.088 ^b |
| No | 38 | (63.3) | | |
| Yes | 11 | (91.7) | | |
| Spinal cord tethering | | | - | 0.454 ^b |
| No | 44 | (69.8) | | |
| Yes | 5 | (55.6) | | |
| Sacralagenesis | | | - | 0.822 ^b |
| No | 45 | (69.2) | | |
| Yes | 4 | (57.1) | | |
| Neoplasm | | | - | 0.588 ^b |
| No | 47 | (69.1) | | |
| Yes | 2 | (50) | | |
| Transverse myelitis | | | 0.05 | 1.000 ^b |
| No | 47 | (67.1) | | |
| Yes | 2 | (100) | | |
| Presence of VP shunt | | | 0.26 (1) | 0.871 ^a |
| No | 35 | (68.6) | | |
| Yes | 14 | (66.7) | | |
| Vesicoureteral reflux | | | 0.90 (1) | 0.342 ^a |
| No | 33 | (64.7) | | |
| Yes | 16 | (76.2) | | |
| Hydronephrosis | | | 8.64 (1) | 0.003 ^a |
| No | 33 | (82.5) | | |
| Yes | 16 | (50) | | |
| Urinary calculi | | | - | 0.319 ^b |
| No | 49 | (69) | | |
| Yes | 0 | (0) | | |
| Recurrent UTI | | | - | 1.000 ^b |
| No | 43 | (68.3) | | |
| Yes | 6 | (66.7) | | |
| Kidney failure | | | - | 0.454 ^b |
| No | 44 | (69.8) | | |
| Yes | 5 | (55.6) | | |
| No Complication | | | - | 0.121 ^b |
| No | 36 | (63.2) | | |
| Yes | 13 | (86.7) | | |
| Pain during performing CIC | | | - | 0.783 ^b |
| No pain | 21 | (70) | | |
| Mild pain | 19 | (70.4) | | |
| Moderate pain | 8 | (57.1) | | |
| Severe pain | 1 | (100) | | |
| Pain during performing CIC | | | 0.89 | 0.765 ^a |
| No pain | 21 | (70.0) | | |
| pain | 28 | (66.7) | | |

CIC - Clean Intermittent Catheterization, VP – ventriculoperitoneal shunt
 Wong-Baker FACES Rating Scale (WBFS) categorized: no pain (score: 0), pain (score: 1 – 10),
 a – Chi-square test,
 b – Fisher’s exact test
 + - Non-Depressed – Children Depression Inventory (CDI) score < 15; Depressed – CDI score ≥ 15

revealed a significant association between the presence of hydronephrosis and higher depression scores (χ^2 (df) = 8.64 (1), p = 0.003). No statistically significant difference in depression scores between children who experience pain. Overall, most demographic and disease-related variables did not significantly impact depression levels in these children.

DISCUSSION

In this study, 72 participants were recruited from two different tertiary hospitals, both of which received similar treatment and consultation from the same pediatric nephrologist, thereby minimizing potential bias. This study on depression among school-aged children

performing CIC in NB reveals intriguing findings that diverge from the broader body of literature available on this topic. While many studies suggest strong associations between demographic factors, pain perception, and disease-related variables and depression levels, our study indicates a lack of significant associations.

To our knowledge, there have been no studies conducted in Malaysia to assess the psychological functioning of school-age children with NB. NB is classified as a chronic disease, which is broadly defined as a condition that lasts one year or more and requires ongoing medical attention or limits activities of daily living, or both (25). Using the CDI, we found that 31.9% of school-age children with NB undergoing CIC are categorized as being depressed. This finding is similar to a study by Sahril et al. in 2021, which examined the prevalence of factors associated with depression severity among school-going Malaysian adolescents with no identified medical condition, showing an overall prevalence of depression of 33.2% among the respondents (26). Sahril et al.'s findings suggested several factors associated with depression, including smoking status, alcohol use, drug use, truancy, bullying, and lack of parental bonding and connectedness (26).

When focusing on the psychological well-being of school-age children who have suffered from chronic medical conditions since a young age, findings are varied. Nicholls et al. studied the psychological functioning of youth with spina bifida (SB) in Colombia. They assessed depression using the CDI and compared the scores with the healthy group. It revealed that 13.64% of the children in the SB group had clinically significant depressive symptoms, while none in the healthy comparison group were categorized as depressed. Nicholls et al. noted that factors contributing to depression included exposure to poverty, lack of resources, poor access to educational settings, and lack of access to quality healthcare (27). A literature review by Dryjańska et al. found that depression prevalence in children and adolescents with chronic kidney disease ranged from 10% to 35%, with adolescents being more at risk than younger children. Contributing factors included illness progression, unique challenges, gender differences (with girls being more affected), lack of caregiver support, poor socioeconomic status, inadequate familial and peer support, and negative coping strategies like avoidance, substance use, self-criticism, and aggression (28).

Recently, several studies have been conducted to investigate psychological issues in Malaysian children with chronic conditions, such as Systemic Lupus Erythematosus (SLE) and idiopathic nephrotic syndrome (INS) (29,30). Using the Child Behaviour Checklist for Ages 6–18 (CBCL 6–18), Amiruddin et al. found that children with SLE have higher depression scores compared to healthy controls, as evidenced by higher withdrawn subscale scores. Factors associated with

these findings include psychosocial issues like multiple hospitalizations, frequent monitoring, and restricted outdoor activities, as well as psychological factors such as isolation, depression, and secrecy stemming from chronic illness challenges (29). Similarly, Mahmud et al. found that children with INS on corticosteroid therapy reported higher levels of depression and emotional problems than healthy peers, with elevated scores linked to higher corticosteroid doses and the presence of cushingoid features (30).

Interestingly, our study found that potential demographic and clinical-related factors such as age, gender, race, family income, mobility, duration of illness, age of initiating CIC, the underlying cause of NB, and perceived pain during CIC did not significantly correlate with depression levels among children with NB who performed CIC. There could be multiple explanations for the lack of significant associations. Whilst no previous studies have examined the relationship between the age of initiating CIC and depression for comparison, we are intrigued to find no correlation between these two variables, as well as with the children's age. This may be attributed to early, efficient orientation to general medical management and especially the emphasis placed to the caregivers and the patient regarding routine adherence to CIC. The recommended CIC to be performed is four to six times a day (31). Starting CIC at an early age and maintaining a consistent routine could lead to habituation, where the child becomes familiar and comfortable with the procedure (32). This habituation likely facilitates the acceptance of CIC as a normal part of life, thereby reducing the risk of negative feelings, including depression. We further hypothesized that frequent CIC might contribute to depression, but our study revealed no significant correlation between CIC frequency and depressed mood. Indeed, higher adherence to CIC is likely to reduce complications that may arise, such as recurrent UTIs, which can prevent unnecessary hospital admissions. This may contribute to patient well-being.

In our study, pain perception did not show a strong association with depression scores. This is in contrast with the study by Agüera-Ortiz et al., which included adults over 18 years and demonstrated a significant correlation between the intensity of pain and the severity of depression, indicating that higher pain levels were associated with more severe depressive symptoms (13). This discrepancy raises important questions about the complexities of mental health in pediatric populations. The developmental stage of children might influence how they perceive pain and its emotional significance, resulting in outcomes that differ from those seen in adults (33). Children's cognitive and emotional development stages may lead them to experience and interpret pain differently, impacting the way it is linked to depression. Furthermore, children may possess different coping mechanisms for managing pain compared to adults (34).

These mechanisms, which might include more reliance on social support, distraction, or imaginative play, could affect their emotional responses and depression scores. More importantly, the majority of patients in this study reported experiencing no pain to very minimal pain while performing CIC. This finding is similar to that of Blanc et al., who reported that 58.2% of patients did not experience pain at all, followed by those who reported a little pain and moderate pain during catheterization (35). This consistency is notable despite Blanc et al. studying adult patients over 18 years old and assessing perceived pain using a Likert scale format, unlike our study, which used the Visual Analog Scale to specify pain intensity through pictures. Nerve damage in the sympathetic and parasympathetic fibers, along with disruptions in spinal cord pathways like the lateral spinothalamic tract, alters pain perception (10).

We argue that the variation in pain perception could be influenced by psychological factors as well. When children and their caregivers understand and accept the necessity of CIC, they experience reduced anxiety and, consequently, perceive less pain. Emotional support from family and healthcare providers can further alleviate fear and discomfort (36). Over time, children may become accustomed to CIC through habituation, which can lead to a diminished perception of pain. Additionally, effective coping strategies, such as relaxation techniques and positive reinforcement, can help manage or lessen discomfort during the procedure, contributing to a more tolerable experience during the procedure (37).

Additionally, we found no significant correlation between depression and self-catheterization ability. This finding contrasts with studies by Oh et al. and Markiewicz et al., who reported significant associations between depression and self-catheterization ability among older patients aged 18 years and above. Patients who were incapable of performing self-catheterization experienced higher depression scores than those who could do it independently (38,39). This is understandable, as the inability to perform self-catheterization may lead to feelings of embarrassment or a decrease in self-esteem, especially among adults. Relying on others for such personal care can be emotionally challenging, impacting their sense of independence and potentially leading to increased depression. Adults may also contend with social stigma or heightened self-consciousness regarding their condition, which can contribute to negative feelings and depression (40). Concerns about body image, privacy, and potential judgment from others might amplify these emotions.

In contrast, children, who were the targeted participants in our study, may often receive substantial emotional and practical support from family members and caregivers. Feeling supported and understood can significantly reduce feelings of isolation or depression. With this support, children also tend to show resilience

and are more adaptable in accepting new situations as part of their everyday life, helping them to cope more effectively with procedures like CIC (41).

Regarding the ability to walk, the study by Brad et al. shows that mobility limitations in individuals with SB are significantly associated with depressive symptoms in the population (42). The lack of significant findings in our study may be influenced by cultural attitudes towards disability and mental health within this population, which might affect the expression and reporting of depressive symptoms, potentially masking correlations (43). Furthermore, the presence of strong family and community support systems might mitigate the impact of demographic factors on depression levels, providing emotional and social buffers that help shield against depression.

In our study, the only significant association identified was between hydronephrosis and higher depression scores, indicating a noteworthy relationship. These results highlight the critical link between hydronephrosis and increased depression levels. Other studies, such as those by Ekberli et al., have demonstrated a correlation between depression and chronic kidney disease (CKD) (44). This suggests a potential interconnectedness, as long-term complications resulting from infrequent CIC in NB can lead to hydronephrosis, which might progress to CKD. However, contrasting findings in the study by Oh et al. revealed that the association between disease-related variables, including hydronephrosis and CKD, did not show a significant correlation with depression (38). These mixed results underscore the complexity of mental health in pediatric populations with chronic conditions, suggesting that different individuals may employ varied coping mechanisms in response to illness. A potential limitation of the study is the use of the CDI, a self-rated depression assessment. This approach might not include parental assessments of the child's depressive symptoms. Parents' perceptions of their child's depression symptoms could provide a more comprehensive overview of the child's mental health. Including parental assessments could help capture symptoms that children might not recognize or report themselves. In addition, we suggest that future research focus on other potential factors not included in our study that may contribute to depression and warrant further investigation, such as sleep disorders, smoking status, alcohol use, drug use, truancy, academic pressure, bullying, peer relationships, and family dynamics (26). Exploring these factors could provide a more holistic understanding of the challenges faced by children with NB undergoing CIC.

CONCLUSION

In summary, the present study revealed a significant proportion of school-age children with neurogenic bladder (NB) and undergoing CIC experience depression,

yet the associated factors are not ascertained, except for the presence of hydronephrosis indicating that specific medical complications may exacerbate emotional distress. It highlights the need for comprehensive care that addresses both the physical and psychological aspects of managing NB in children, emphasizing the importance of monitoring mental health alongside physical health to improve the overall quality of life.

ACKNOWLEDGEMENTS

The author would like to acknowledge all the staff of the Paediatric Department at Hospital Universiti Sains Malaysia, as well as those at Hospital Raja Perempuan Zainab II, and the patients involved for their contribution and assistance during the data collection and completion of the thesis. Special thanks to Associate Professor Rohayah Husain for permitting us to reprint the validated Malay-translated CDI used in this study. This study did not receive any external grants.

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