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ORIGINAL RESEARCH

Unheard Struggles: Exploring Health-Related Quality of Life Determinants and Coping Mechanisms Among Children with Hearing Loss from Parents and Caregivers Perspective

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Purpose: Childhood hearing loss is an emerging public health concern. This study aimed to compare the quality of life (QOL) and coping strategies between children with and without hearing loss. It also explored the impact of coping strategies on the QOL of children with hearing loss.

Methods: The study included 95 children with hearing loss and 107 healthy controls aged 6–18 years, recruited from special education schools. QOL was evaluated using the SF-12 health survey, and coping strategies were assessed with the Brief COPE inventory. Data analysis was conducted using descriptive and inferential statistics.

Results: Children with hearing loss reported lower QOL scores in areas such as role functioning, emotional well-being, mental health, and physical health. They were more likely to use maladaptive coping strategies like denial, behavioral disengagement, and self-blame, whereas healthy children favored adaptive strategies like self-distraction, emotional support, and positive reframing. Problem-focused coping showed a positive association with role functioning ($r = 0.46$, $p < 0.01$), emotional roles ($r = 0.18$, $p < 0.05$), and mental health ($r = 0.19$, $p < 0.05$). Sociodemographic factors, including grade level and rural residence, significantly influenced QOL, with children in rural areas ($OR = 4.66$; $p = 0.03$) and lower grades ($OR = 8.89$; $p = 0.05$) facing greater challenges. Multiple regression analysis revealed a significant relationship between the self-distraction and physical component summary score ($p = 0.01$). Self-distraction ($p = 0.01$) and the acceptance coping strategy ($p = 0.02$) had a notable effect on the mental summary score of SF-12 scores of children with hearing loss.

Conclusion: This study concluded that children with hearing impairment showed poor quality of life and these children use maladaptive coping strategies to combat with the stress caused by hearing loss. Early detection, community awareness, and customized support programs are crucial to enhancing the QOL of children with hearing loss and minimizing the condition's long-term impact.

Keywords: quality of life, coping strategy, hearing loss, children, Saudi Arabia

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Introduction

Hearing loss in children is a significant global public health concern, with profound effects on communication, social interactions, educational achievements, and overall quality of life. It can vary in severity, ranging from mild to profound, and may arise due to genetic factors, complications during birth, certain infections, chronic ear conditions, specific medications, exposure to excessive noise, or aging.[1] According to World Health Organization (WHO), over 5% of the world's population or 430 million people including 34 million children people suffer from disabling hearing loss, that number will increase to 700 million by 2050. [2] This condition poses challenges at all ages, particularly affecting interpersonal communication, psychosocial well-being, and individual quality of life.[3] Its burden is anticipated to increase significantly in low- and middle-income countries, ranking among the top contributors to disease burden by 2030.[2]

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Despite the considerable impact of hearing loss, there is limited epidemiological data on its health outcomes, particularly for individuals who are deaf or hard of hearing.[4] Existing studies reveal that hearing loss negatively affects various aspects of life,[5–12] including mental health, social functioning, and overall health-related quality of life (HRQoL). HRQoL is a multidimensional concept encompassing physical, emotional, and social well-being and is crucial for understanding the comprehensive burden of chronic health conditions. The WHO defines quality of life as individuals' perceptions of their position in life within the context of their culture, value systems, goals, expectations, standards, and concerns.[13]

The prevalence of childhood hearing loss varies across regions and is influenced by genetic predispositions, prenatal and postnatal factors, and environmental exposures. Early detection is vital, as timely intervention can improve communication skills, educational outcomes, and overall quality of life. School-entry hearing screenings have been proposed as an effective measure for early detection in developing countries.[14,15] Prevalence rates among schoolchildren vary significantly, ranging from 1.4% in China,[16] 1.49% in the UK,[17] and 2% in Sweden[18] to higher rates of 4.4% in Southwestern Saudi Arabia,[19] 9.8% in Iran[20] 11.9% in India[21] and 20.9% in Egypt.[22]

In recent years, the focus has shifted from merely identifying the causes of hearing loss to understanding its impact on individuals' lives, as outlined in the International Classification of Functioning, Disability, and Health.[23] This approach emphasizes improving functionality, participation, and HRQoL. Studies suggest that coping strategies for hearing loss are influenced more by psychosocial factors—such as social support, personal adjustment, and attitudes—than by the severity of the impairment. Effective coping involves adaptive strategies, such as seeking clarification, while maladaptive strategies, such as pretending to understand, can hinder communication and exacerbate challenges.[24] However, research on coping strategies specific to children with hearing loss remains scarce.

In Saudi Arabia, childhood hearing loss is a significant issue, particularly due to factors such as consanguinity and limited access to early intervention programs. Al-Hasa, in the Eastern Province, is no exception. However, limited research exists on how children with hearing loss in this region perceive their HRQoL and the coping mechanisms they employ to manage daily challenges. Understanding these determinants is essential for developing culturally and contextually appropriate interventions. Factors such as family support, access to assistive technologies, communication barriers, and educational opportunities are likely to play critical roles in shaping HRQoL and coping strategies.[19,25] This study aims to address this research gap by exploring the determinants of HRQoL and coping mechanisms among children with hearing loss in Al-Hasa, Saudi Arabia.

Rational of the Study

Childhood hearing loss significantly impacts communication, social development, education, and overall quality of life. While global studies highlight these challenges, research specific to Saudi Arabia, particularly Al-Hasa, remains limited. Genetic factors like consanguinity and barriers to early intervention may contribute to its prevalence and effects. Most existing studies focus on medical aspects rather than psychosocial and functional outcomes. Understanding how children with hearing loss perceive their quality of life and the coping strategies they use is crucial. Given the increasing prevalence of childhood hearing loss and its far-reaching consequences, this study seeks to fill a critical research gap by investigating the determinants of QOL and coping mechanisms among children with hearing loss in Al-Hasa. The findings will provide valuable insights for healthcare providers, educators, and policymakers, guiding the development of culturally appropriate support systems and intervention strategies that improve the lives of affected children and their families.

Materials and Methods

Study Design

This case-control study investigated the association between quality of life (QOL) and coping strategies in children with and without hearing loss from December 2023 to July 2024. Participants were recruited from special education schools. Ethical approval was granted by the Deanship of Scientific Research at King Faisal University, AlHasa, Saudi Arabia

(KFU-REC-2023-SEP-ETHICS1350). The research adhered to the principles of the Declaration of Helsinki regarding human subjects. Informed consent was obtained from all participants and their guardians before data collection began.

Participants

The study included 95 children aged 6–18 years diagnosed with severe hearing loss, confirmed by healthcare providers. Eligibility was based on developmental, medical, familial, and educational records. Informal verbal consent was secured from the children and their parents. Exclusion criteria included children younger than six or older than 18 years. A control group of 107 children without hearing loss was selected, meeting the same inclusion and exclusion criteria.

Sample Calculation

As no prior studies have explored the QOL and coping strategies of children with hearing loss in Saudi Arabia, a convenience sampling method was employed.[26,27] This approach was chosen due to its practicality and reduced requirements for time, cost, and resources. Ninety-five children with hearing loss and 107 normative controls who met the inclusion criteria participated in the study.

Data Collection Tools

In order to achieve the goal of the present study, various measures including the Short Form-12 health Survey version 2 was used to measure QOL and Brief COPE inventory was used to assess coping strategies. The study also included a demographic questionnaire prepared by the researcher. These measures were originally designed for adults. The researcher selected these measures because there are no widely validated child-specific versions of these tools that comprehensively assess coping strategies and quality of life for individuals aged 6–18 years. Prior to data collection, the questionnaire underwent a three-step translation and validation process. First, two bilingual professors proficient in both English and Arabic translated the questionnaire into Arabic, followed by a back-translation into English by two other bilingual professors. In the second phase, expert feedback and recommendations were incorporated to refine the final version. Lastly, the Arabic version was tested in a pilot study with 25 healthy volunteers from the local community to assess its reliability and validity. After this evaluation, specialists approved the final version, which was then distributed through personal contacts. These questionnaires were completed by parents or guardians on behalf of the children, with the children present during the process. While the SF-12 and Brief COPE are typically designed as self-report instruments, several studies have utilized parent proxy reports, particularly when assessing children with disabilities.[28–30] Although parent-reported measures may introduce some degree of bias, they are commonly used in pediatric research when children are too young or having hearing impairment that prevent them from reliably completing self-assessments.

Short-Form-12 (SF-12): The Short Form 12 (SF-12) is a commonly used questionnaire designed to assess an individual's health-related quality of life (HRQoL). It is a shorter version of the SF-36 questionnaire, which is widely used in clinical and research settings to evaluate physical and mental health.[31] The SF-12 consists of 12 items that are divided into two main components: physical (PCS-12) and mental component scale (MCS-12) and each consisted of six items. This scale evaluates eight health domains: physical functioning, physical role, pain, general health, vitality, social functioning, emotional role, and mental health.[32] Each item in the SF-12 is scored on a Likert scale, score ranging from 0 to 100 and the responses are weighted to generate the PCS and MCS scores. Higher score in this scale indicates better health.[33] PCS-12 and MCS-12 showed a good internal consistency reliability of 0.89 and 0.76 respectively.[34] In this study, reliability was established with Cronbach's alpha values of 0.80 for the PCS-12 and 0.76 for the MCS-12.

Brief COPE: Coping strategies were measured using the Brief COPE inventory, which evaluates both adaptive and maladaptive responses to stress.[35] The Brief COPE contains 28 items that reflect different coping strategies including self-distraction, active coping, denial, substance use, emotional support, instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. Respondents are asked to indicate how frequently they use each strategy on a scale from 1 (never) to 4 (very often).[36] Subscale scores were calculated by summing relevant items, with higher scores reflecting greater use of that strategy. Previous studies have found that the

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internal consistency reliability of the COPE inventory varies between 0.42 and 0.89.[37] For the present study, Cronbach's alpha values ranged from 0.43 to 0.85.

Demographic and Clinical Variables: Information on demographic factors (age, sex, living area, family structure, income, occupation, and socioeconomic status) and clinical details (severity of hearing loss, comorbidities, and developmental history) was obtained from parent interviews and medical records.

Procedure

Data collection involved in-person interviews with parents or guardians conducted by trained senior medical students. Collaboration between healthcare facilities and educational institutions ensured access to relevant medical and academic records. Participation was voluntary, with informed consent obtained prior to the study. Participant confidentiality and cultural sensitivities were maintained throughout, and all data were anonymized and securely stored.

Statistical Analysis

Data analysis was conducted using SPSS software (IBM, SPSS, Version, 27.0, Chicago, IL, USA). Descriptive statistics summarized the study population, while chi-square tests analyzed categorical variables. Student's *t*-test compared group means, and Spearman's correlation assessed the relationship between QOL and coping strategies. A binary logistic regression model evaluated the predictive value of QOL for hearing loss, with demographic and QOL variables as independent predictors. Model fit was assessed using Hosmer-Lemeshow and R^2 values. Multiple regression models determined the influence of coping strategies on QOL, with standardized beta coefficients used to interpret findings. Statistical significance was set at $p < 0.05$.

Results

Table 1 summarizes the demographic details of the participants. The study involved 202 children from different areas of Alhasa, Saudi Arabia. Of these, 73 out of 95 children with hearing loss and 89 out of 107 normative children met the

Table 1 Participants Socio-Demographic Characteristics (N = 162)

Variables	Hearing Loss n = 73 n (%)	Normal Hearing n = 89 n (%)	Chi Square Test	*P value*
Gender			1.81	0.21
Male	30 (41.09%)	46 (51.69%)		
Female	43 (58.90%)	43 (48.31%)		
Age			2.65	0.11
6–12 years	43 (58.90%)	42 (47.19%)		
13–18 years	30 (41.09%)	47 (52.81%)		
Grade			18.49	0.01**
Elementary	35 (47.94%)	13 (14.61%)		
Middle	13 (17.81%)	41 (46.07%)		
High school	25 (34.25%)	35 (39.32%)		
Family status			27.72	0.01**
Joint	39 (53.42%)	86 (96.63%)		
Nuclear	34 (46.57%)	3 (3.37%)		

(*Continued*)

Table 1 (Continued).

Variables	Hearing Loss n = 73 n (%)	Normal Hearing n = 89 n (%)	Chi Square Test	*P value*
Area of residence			11.98	0.01**
Urban	58 (79.45%)	85 (95.50%)		
Rural	15 (20.55%)	4 (4.50%)		
Monthly income			1.28	0.53
<10000 Saudi Riyal	39 (53.42%)	41 (46.06%)		
10,001–15000 Saudi Riyal	18 (24.66%)	23 (25.85%)		
>15001 Saudi Riyal	16 (21.92%)	25 (28.09%		
Family occupation			11.11	0.01**
Government employees	48 (65.75%)	47 (52.81%)		
Private employee	19 (26.03%)	17 (19.10%)		
Businessman	6 (8.22%)	25 (28.09%)		
Housing status			0.50	0.48
Own	45 (61.64%)	54 (60.67%)		
Rented	28 (38.36%)	35 (39.33%)		

Note: $^{**}p < 0.01$.

inclusion criteria for the study. Ultimately, 162 children who provided valid data were included in the final analysis. The results showed that children studying in elementary schools had a significantly higher rate of hearing loss compared to middle and high school students ($\chi^2 = 18.49$, $p < 0.01$). Moreover, a larger proportion of normative children were found in joint families compared to those from nuclear families ($\chi^2 = 27.72$, $p < 0.01$). Additionally, percentage of children with normal hearing was significantly higher in children living in urban areas as compared to rural areas ($\chi^2 = 11.98$, $p < 0.01$). The findings also indicated that children of governmental employees had a higher prevalence of hearing impairment than private employees and businessmen ($\chi^2 = 11.11$, $p < 0.01$). No significant differences were observed between the groups in terms of gender, age, monthly income, or housing type.

Table 2 displays the mean scores and standard deviations (SDs) for two groups of participants for the measure of SF-12 and coping strategies, along with the t-values. For the measure of SF-12, results revealed significant differences between the two groups in several dimensions: role functioning (t = -7.38, $p < 0.01$), role physical (t = -2.09, $p < 0.05$), role emotion (t = -4.66, $p < 0.01$), mental health (t = -4.89, $p < 0.01$) as well as physical component summary (t = -4.01, $p < 0.01$) and mental component summary (t = -5.59, $p < 0.01$). The mean scores clearly indicated that children with hearing loss reported poor QOL in role functioning (M = 41.85, SD = 25.60), role physical (M = 56.16, SD = 24.21), role emotion (M = 40.54, SD = 31.79), and mental health (M = 56.91, SD = 22.75) compared to normative children (Mean scores = 73.86, 64.32, 66.18, 78.65; SDs = 28.29, 24.96, 37.09, 31.88 respectively). The results also indicated that physical component summary (M = 47.67, SD = 16.20), and mental component summary (M = 60.00, SD = 20.74) were poor in children with hearing loss than healthy children.

Significant differences were observed in the most of coping strategies used by participants. Participants with hearing loss showed a higher reliance on denial (M = 5.30, SD = 2.04), behavioral disengagement (M = 5.31, SD = 1.92), humor (M = 5.01, SD = 1.94) and self-blame coping (M = 5.89, SD = 2.04) compared to healthy children (mean scores = 4.03, 3.96, 3.71, and 4.41; SDs = 1.84, 1.52, 1.64, and 1.89 respectively). In contrast, normative children reported using self-distraction (M = 5.48, SD = 1.62), emotional support (M = 4.51, SD = 1.57), venting (M = 4.91, SD = 1.87), positive

Table 2 Descriptive Statistics for Children with Hearing Loss and Normal Children for Quality of Life and Coping Strategies

Quality of Life	**Study Group (n = 73)**		**Control Group (n = 89)**		**t-value**	***P* value**
	M	***SD***	***M***	***SD***		
Role Functioning	41.85	25.60	73.86	28.93	−7.38	0.01**
Role Physical	56.16	24.21	64.32	24.96	−2.09	0.04*
Bodily pain	84.26	33.20	79.49	24.00	1.05	0.29
General Health	74.31	30.89	77.80	25.40	−0.79	0.43
Vitality	68.83	24.57	73.59	23.03	−1.27	0.21
Social Functioning	63.56	26.52	66.06	24.75	−0.62	0.54
Role Emotion	40.54	31.79	66.18	37.09	−4.66	0.01**
Mental Health	56.91	22.75	78.65	31.88	−4.89	0.01**
Physical Component Summary	47.67	16.20	57.07	13.66	−4.01	0.01**
Mental Component Summary	60.00	20.74	75.61	14.72	−5.59	0.01**
Coping Strategies						
Self-Distraction	3.76	0.51	5.48	1.62	−8.67	0.01**
Active Coping	4.45	2.06	4.91	1.96	−1.44	0.15
Denial	5.30	2.04	4.03	1.84	4.14	0.01**
Substance Abuse	2.41	0.94	2.26	0.83	1.82	0.21
Emotional Support	3.36	2.20	4.51	1.75	−3.68	0.01**
Use of Information Support	4.82	2.02	4.85	1.77	−0.11	0.96
Behavioral Disengagement	5.31	1.92	3.96	1.52	−4.98	0.01**
Venting	4.15	1.80	4.91	1.87	−2.61	0.01**
Positive reframing	4.84	1.91	5.22	1.91	−1.91	0.05*
Planning	4.60	1.94	5.07	1.78	−1.62	0.10
Humor	5.01	1.94	3.71	1.64	4.59	0.01**
Acceptance	3.89	1.85	5.23	1.97	−4.74	0.01**
Religion	5.43	2.08	5.20	2.00	0.73	0.46
Self-blame	5.89	2.04	4.41	1.89	−4.74	0.01**
Problem Focused Coping	10.31	3.97	14.84	4.79	−6.89	0.01**
Emotional Focused Coping	15.63	5.16	18.03	6.98	−8,56	0.01**
Dysfunctional Coping	19.64	7.94	14.90	6.08	8.94	0.01**

Note: $^{**}p < 0.01$; $^{*}p < 0.05$.

reframing (M = 5.22, SD = 1.91), acceptance (M = 5.23, SD = 1.97) more frequently than children with hearing loss, whose mean scores were 3.76, 3.36, 4.15, 4.84 and 3.89 and SDs were 0.51, 2.20, 1.80, 1.91 and 1.85 respectively. However, no significant differences were found between the groups for active coping, denial, use of informational support, planning, and religion.

Spearman's correlation coefficient was used to assess the relationship between different dimensions of QOL and coping strategies as shown in Table 3. The findings indicated that role function (r = 0.46, $p < 0.01$), role emotion (r = 0.18, $p < 0.05$), and mental health (r = 0.19, $p < 0.05$) was positively and significantly related with problem focused coping. In addition, role function was positively and significantly related with emotional focused coping (r = 0.27, $p < 0.01$). However, none of the dimension of QOL were correlated with dysfunctional coping strategy.

Apart from QOL and coping strategies, sociodemographic factors such as grade, family status, areas of residence and family occupation were found to significantly differ between children with hearing loss and those without hearing loss. These confounding variables, along with quality of life dimensions, were incorporated as independent variables into a binary logistic regression model. The Hosmer-Lemeshow test indicated that the model fit was satisfactory (P = 0.74). The predictive values for each of the variables are presented in Table 4.

Table 3 Correlation Between Quality of Life and Coping Strategies

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1	RF	1.00												
2	RP	0.13	1.00											
3	BP	0.01	0.13	1.00										
4	GH	0.03	0.10	0.58**	1.00									
5	VT	0.15	−0.03	0.19*	0.24**	1.00								
6	SF	0.00	−0.03	0.21**	0.27**	0.26**	1.00							
7	RE	0.25**	0.04	0.05	0.09	0.06	0.03	1.00						
8	MH	0.18*	0.17*	0.20**	0.18*	−0.02	0.11	0.54**	1.00					
9	PCS	0.11	−0.01	0.10	0.09	0.12	0.26**	0.13	0.09	1.00				
10	MCS	0.26**	0.25**	−0.38**	0.33**	0.18*	0.19*	0.12	0.19*	0.26*	1.00			
11	PFC	0.46**	0.14	-,09	0.02	0.08	0.03	0.18*	0.19*	0.23*	0.34**	1.00		
12	EFC	0.27**	0.05	−0.11	−0.23	0.04	0.04	0.05	0.12	0.17*	0.24**	0.81**	1.00	
13	DFC	−0.03	−0.03	−0.05	−0.09	0.03	0.02	−0.22	−0.14	0.05	0.05	0.37**	0.60**	1.00

Note: **p < 0.01; *p < 0.05.

Abbreviations: RF, Role Function; RP, Role Physical; BP, Bodily Pain; GH, General Health; VT, Vitality; SF, Social Functioning; RE, Role Emotion; MH, Mental Health; PCS, Physical Component Summary; MCS, Mental Component Summary; PFC, Problem Focused Coping; EFC, Emotional Focused Coping; DFC, Dysfunctional Coping.

Table 4 Result of Binary Logistic Regression Model for Quality of Life of Children with Hearing Loss

Variables	OR	95%CI	*P value*
Grade (ref: High school)			
Elementary	0.05	0.01–0.34	0.99
Middle	4.66	1.16–18.96	0.03*
Family status (ref: Nuclear)			
Joint	0.12	0.02–0.65	0.83

(*Continued*)

Table 4 (Continued).

Variables	**OR**	**95%CI**	***P value***
Area of residence (ref: Urban)			
Rural	8.89	0.98–27.58	0.05*
Family occupation (ref: Business)			
Government employees	0.15	0.03–0.71	0.71
Private employee	0.13	0.02–0.70	0.79
Quality of life			
Role function	1.04	0.94–0.98	0.01**
Bodily pain	0.97	1.01–1.05	0.01**
Role emotion	1.01	0.97–1.03	0.02*
Mental health	1.02	0.96–1.04	0.05*

Note: ***p* < 0.01; **p* < 0.05.
Abbreviation: OR, odd ratio.

The logistic regression analysis results presented in Table 4 revealed that grade (OR = 4.66; *p* = 0.03), and area of residence (OR = 8.79; *p* = 0.05) were significant related to children with hearing loss. The results indicated that hearing loss were 4.66 times more likely in children studying in middle classes and nearly nine time more likely in children living in rural areas. However, no significant correlations were found between hearing loss and family status or family occupation. The study also hypothesized that quality of life could serve as a predictor for hearing loss. The analysis demonstrated that factors such as role function, bodily pain, role emotion, and mental health were significantly linked to children with hearing loss, even after adjusting for key confounders including, grade, family status, area of residence and family occupation.

The multiple regression analysis was applied to examine the role of coping strategies adopted by the participants in predicting their quality of life. For this, separate analysis was run for physical summary scale and mental summary scale. Results of multiple regression analysis presented in Table 5 revealed a significant relationship between the physical component summary score and self-distraction (*p* = 0.01). Regarding the mental component summary, it was observed

Table 5 Impact of Coping Strategies on Quality of Life of Children with Hearing Loss

Variables	**Unstandardized Coefficient**		**Standardized Coefficient**	**95%CI**	***P* value**	**Unstandardized Coefficient**		**Standardized Coefficient**	**95%CI**	***P* value**
	B	**SE**	**Beta**			**B**	**SE**	**Beta**		
	Regression Model for Physical Component Summary					**Regression Model for Mental Component Summary**				
SD	2.62	0.96	0.25	0.72–1.63	0.01**	3.54	1.13	0.27	1.28–5.79	0.01**
AC	0.25	0.99	0.33	−1.71–2.22	0.80	0.44	1.18	0.04	−1.88–2.78	0.70
DN	−0.19	0.94	−0.03	−2.05–1.67	0.83	1.09	1.12	0.11	−1.11–3.30	0.33
SA	−1.36	1.00	−0.16	−3.36–0.60	0.17	−1.26	1.18	−0.12	−3.61–1.08	0.29
ES	0.10	0.96	0.01	−1.79–2.00	0.91	1.37	1.13	0.14	−0.87–3.61	0.23
US	1.30	0.94	0.16	−0.54–3.15	0.16	1.42	1.10	0.13	−0.76–3.61	0.20

(*Continued*)

Table 5 (Continued).

Variables	Unstandardized Coefficient		Standardized Coefficient	95%CI	*P* value	Unstandardized Coefficient		Standardized Coefficient	95%CI	*P* value
	B	SE	Beta			B	SE	Beta		
	Regression Model for Physical Component Summary					Regression Model for Mental Component Summary				
BD	−0.44	1.02	−0.05	−2.46–1.57	0.66	−1.91	1.21	−0.18	−4.30–0.48	0.12
VT	−0.27	1.22	−0.03	−2.69–2.15	0.82	=1.11	1.45	−0.11	−3.98–1.75	0.44
PR	0.62	1.21	0.07	−1.76–3.00	0.61	−1.86	1.43	−0.19	−4.69–0.96	0.19
PL	−1.97	1.22	−0.23	−4.38–0.43	0.11	−1.81	1.44	−0.17	−4.67–1.04	0.21
HU	0.26	1.02	0.03	−1.76–2.29	0.80	0.62	1.21	0.06	−1.78–3.03	0.61
AT	0.72	0.98	0.09	−1.21–2.65	0.46	2.67	1.16	0.28	0.38–4.97	0.02*
RL	−0.12	0.67	−0.16	−1.04 – 1.20	0.86	0.17	0.79	0.02	−1.40 – 1.74	0.83
SB	0.42	0.78	0.05	−1.13 – 1.97	0.59	−0.13	0.93	−0.01	−1.97 – 1.70	0.88

Note: $^{**}p < 0.01$; $^{*}p < 0.05$.

Abbreviations: SD, Self-Distraction; AC, Active Coping; DN, Denial; SA, Substance Abuse; ES, Emotional Support; US, Use of Information Support; BD, Behavioral Disengagement; VT, Venting; PR, Positive Reframing; PL, Planning; HU, Humor; AT, Acceptance; RL, Religion; SB, Self-blame.

that self-distraction ($p = 0.01$) and the acceptance coping strategy ($p = 0.02$) had a notable effect on the mental summary score of SF-12 scores of children with hearing loss.

Discussion

This study aimed to explore the differences in quality of life and coping strategies between children with hearing loss and children with normal hearing. Previous studies have demonstrated that disabling hearing loss is associated with poorer physical health[12,38–40] and lower mental well-being.[41–43] This study adds to the limited research linking hearing loss with a poor quality of life in children. To the best of our knowledge, it is the first study to assess quality of life using SF-12 in this particular group, specifically focusing on children rather than older adults in Saudi Arabia. Our findings revealed that children with hearing loss reported poor QOL in role functioning, role physical, role emotion, mental health, physical component summary and mental component summary than children with normal hearing. Children with hearing impairment report poor quality of life due to a combination of communication difficulties, social isolation, educational barriers, emotional distress, and family-related stressors.[44,45] Children with hearing impairment may struggle to participate in conversations with peers and adults, leading to feelings of isolation and loneliness.[46] The inability to fully communicate with family members can result in frustration and misunderstandings, leading to emotional distress. Communication difficulties may create a sense of alienation, affecting the child's mental health. Moreover, children with hearing impairments may have difficulty participating in physical activities or sports due to communication barriers or social challenges. Lack of engagement in physical activities can affect both physical and mental health.

This study examined the coping strategies employed by our sample. There is a scarcity of research on the coping strategies employed by children with hearing loss, particularly in Saudi Arabia. The present study highlights ten primary coping mechanisms— denial, substance use, behavioral disengagement, humor and self-blame, self-distraction, emotional support, venting, positive reframing, and acceptance coping— that play a crucial role in managing psychological distress. Previous studies have identified common coping methods for psychological distress among individuals with disabilities, including seeking social support, problem-solving, engaging in physical activity, avoidance, using social media, watching movies, and nurturing relationships.[47,48]

The analysis conducted in this study showed significant difference in mean coping strategy scores between the two groups of participants aligning with the recent findings, which also showed notable differences in the use of coping strategies between the control and intervention groups at post-test and follow-up assessments.[49] In Our study, children with hearing impairment exhibited a higher reliance on denial, behavioral disengagement, humor and self-blame coping. These findings are somewhat in line with previous researches,[50,51] which found that patients with hearing loss used humor, withdrawal, avoidance and planning coping strategy as a means of easing the current unfavorable situation and concealing one's emotion from others. Denial can be a common coping mechanism for individuals facing chronic conditions, including hearing impairment, as a way to avoid confronting the reality of their limitations.[52] Children may deny the impact of their disability in order to reduce the emotional distress associated with accepting their condition, especially in social or educational settings where they might feel different from their peers. Behavioral disengagement coping strategy involves withdrawing or avoiding social situations.[37] Children with hearing impairment may disengage behaviorally as a way of coping with difficulties related to communication, social interactions, and academic performance. This withdrawal can serve as a defense mechanism to protect them from further frustration or negative emotions, particularly if they feel overwhelmed or unsupported. Humor is regarded as an adaptive coping strategy because it can alleviate the burden of perceived stress and promote positive emotional states in the face of challenging situations.[53] For children with hearing impairment, using humor may help defuse situations where they experience social exclusion or communication challenges. Humor allows them to maintain social connections and cope with negative emotions in a more lighthearted manner. Self-blame refers to the tendency to hold oneself personally responsible for a negative event or situation. It is a common reaction to stress events and has certain effects on how individual adapt.[54] Previous studies have found that children who experience high levels of self-blame are more prone to internalizing problems, whereas those with lower levels of self-blame do not exhibit the same rise in such difficulties.[55] Children with hearing impairment may also engage in self-blame as a way to make sense of their difficulties or perceived shortcomings. This coping strategy may be influenced by societal stigma or internalized negative beliefs about their disability. They might blame themselves for challenges in communication or social interactions, feeling responsible for any difficulties they experience.

The results of our analysis suggested that healthy children rely more on coping strategies such as self-distraction, emotional support, venting, positive reframing and acceptance coping strategies deal with normal stress. Self-distraction coping involves shifting focus away from stressors or challenges. Children with typical neurological development may be more likely to use this coping mechanism than children with hearing problem, potentially due to differences in social interaction abilities. For example, children who are neurotypical might engage in activities such as watching television, playing video games, or socializing with friends to help them take their minds off stressors. Although our findings do not directly align with existing studies, they seem to contrast with research indicating that optimism is commonly employed by children when dealing with problems.[56] The reliance on emotional support coping strategies was more prevalent in children with normal hearing than in children with hearing impairment. Emotional support refers to the assistance and comfort provided by others, especially in times of stress or emotional distress. Emotional support serves as a crucial protective factor that can help mitigate the impact of various risk factors and reduce the likelihood of negative health outcomes among adolescents. Research has consistently shown that emotional support plays a significant role in buffering the effects of stress and adversity.[57] Venting is a useful coping strategy for children who are neurotypical, helping them to release tension, process their emotions, and gain emotional support. Venting allows people to express their dissatisfaction and stress, which promotes emotional growth, enhances self-regulation, and strengthens social ties.

However, for venting to be truly beneficial, it should be balanced with other coping strategies and guided by supportive adults who help children process and solve the underlying issues. Positive reframing is a cognitive coping strategy that involves changing the way a person perceives a stressful or challenging situation by focusing on the potential positive aspects or looking at it from a different perspective. For children who are neurotypical, positive reframing can be a valuable tool to help them manage stress, navigate difficult situations, and develop resilience. Previous research has highlighted that positive reframing serves as a protective factor against perceived stress and can be viewed as an adaptive coping mechanism.[58–60] Acceptance is considered one of the adaptive coping strategies that helps individuals process and adapt to stress. Instead of actively trying to alter the stressor, acceptance allows individuals to focus on managing their emotional response to it. Existing researches demonstrate positive correlations between adaptive coping mechanisms and beneficial outcomes, including enhanced well-being and greater life satisfaction.[61,62] These studies highlight the role of adaptive coping strategies in promoting emotional resilience, reducing stress, and improving overall psychological health. By using effective coping mechanisms, individuals are better equipped to manage life's challenges, leading to more favorable emotional and mental outcomes.

This study highlights the importance of coping strategies in improving the quality of life for children with hearing loss by examining the relationship between each coping strategy. Findings of this research revealed that problem-focused coping plays a critical role in enhancing the QOL of children with hearing loss, especially in dimensions such as role functioning, role emotion, and mental health. Children with hearing loss face unique challenges, including communication difficulties, social isolation, and educational hurdles, all of which can significantly affect their emotional well-being and overall QOL. However, research suggests that problem-focused coping can help mitigate these challenges and improves QOL.[63–65]

Present study explored how demographic factors relate to the QOL of children with hearing loss. However, after accounting for sociodemographic characteristics, many of the group differences disappeared, suggesting that variations in coping strategies are likely more associated with factors such as age, gender, socioeconomic status, or cultural background, rather than being directly related to hearing loss itself. The analysis showed that grade level and area of residence were key predictors of QOL for children with hearing loss. In particular, the results indicated that hearing loss was more prevalent among middle school children. These findings are consistent with prior research, which also reported a higher prevalence of hearing loss was found in children aged 10 years or older.[64] Age continues to be a significant factor linked to hearing loss,[66,67] and this study found that hearing loss was most prevalent in the middle grades children (10–14 age group). This could be due to prolonged exposure to risk factors. As a result, early detection and intervention programs, along with increased community awareness, could play a crucial role in preventing disabling hearing loss and enhancing QOL. The result of our study also indicated that children living in rural areas reported higher rate of hearing loss. Rural children may have poor access to medical services compared to their urban counterparts, which could increase their risk of developing hearing impairment.[68]

The analysis demonstrated that the dimensions of SF-12 such as role function, bodily pain, role emotion, and mental health were significantly linked to children with hearing loss. Our results were consistent with previous studies, which evaluated the effect of hearing loss on the quality of life in pediatric patients.[69,70] Hearing loss limits a child's ability to hear speech clearly, making communication with family, peers, and teachers difficult. This can hinder their ability to express themselves effectively and understand others, leading to frustration and feelings of isolation. Moreover, hearing loss can lead to emotional distress, including frustration, anxiety, and depression.[71–74] Children may feel left out or different from their peers, affecting their self-esteem and mental health. Over time, these emotional challenges can significantly affect their overall quality of life. If hearing loss is not addressed, its long-term effects can extend into adulthood, influencing career opportunities, relationships, and overall life satisfaction.[75] Early identification and intervention are critical in mitigating these long-term consequences.

The final interestingly finding of this study indicate that physical component summary was significant related with self-distraction coping. Our results are inconsistent with previous studies, which suggested that patient with hearing impairment used frequently planful problem solving and self-controlling coping strategies than escape/avoidance coping.[76] Mental component summary was reported as significantly associated with self-distraction (avoidance coping) and acceptance (approach coping) strategy. The results of our study are aligned with previous researches,[36,64] suggesting that patients with multiple sclerosis utilize problem focused coping and task oriented coping when managing stress and illness. Mental health component of SF-12, plays a critical role in how individuals respond to stress and illness. Individuals with better mental health scores are more likely to engage in active coping strategies, which helps them manage stress more effectively and improve their quality of life. Conversely, those with lower mental health scores may rely on avoidance or disengagement, which can increase psychological distress and impair their ability to cope with challenges.

Conducting a study among children with hearing loss presents several limitations. One of these limitations was relatively small sample size. The small sample size and exploratory nature of our analysis limited the ability to explore several potential associations with QOL or coping, particularly those related to socio-demographic factors, the degree of hearing loss, and cognitive decline. These factors should be further investigated to better understand their impact on children's QOL. The exploratory nature of this study suggests the need for larger studies that incorporate these variables.

However, bootstrapping techniques were used to ensure the reliability of our results. Second, the observational and cross-sectional design of the study prevents any conclusions regarding causality between coping strategies and QOL. As a result, it remains unclear whether an individual's coping strategies directly influence their QOL. The third limitation relates to the potential for selection bias in how participants were recruited. By sourcing participants from clinics, special education schools, and support centers, the sample may not fully represent the larger population of children with hearing impairment. These particular settings might attract children with specific traits or those who have greater access to resources, potentially skewing the findings. The fourth limitation arises from the focus on children aged 6 to 18 years, which restricts the ability to apply the results to children outside this age range, such as younger or older individuals. Additionally, the reliance on parent or caregiver reports for gathering demographic and clinical data introduces the possibility of inaccuracies or bias in the responses. The fifth limitation concerns the study's cross-sectional design, which limits the ability to draw conclusions about cause-and-effect relationships between coping strategies and QOL. While efforts were made to match participants on factors like age, location, and ethnicity, the inability to match siblings or other family members may have influenced the results. Lastly, the data collection tool was designed primarily for individuals aged 18 and older, which could have impacted its relevance and effectiveness for children. Longitudinal studies would provide more in-depth insights into how these relationships evolve over time.

Conclusion

This study provides valuable insights into the QOL and coping strategies of children with hearing loss in Saudi Arabia, highlighting significant differences when compared to their peers with normal hearing. Children with hearing loss experience poorer QOL across several dimensions, including role functioning, emotional well-being, mental health, and physical health, primarily due to communication difficulties, social isolation, educational barriers, and emotional distress. The study also sheds light on the coping strategies employed by children with hearing loss, revealing a greater reliance on maladaptive strategies, such as denial, behavioral disengagement, and self-blame, compared to children with normal hearing. In contrast, healthy children tend to rely more on adaptive coping strategies like self-distraction, emotional support, and positive reframing. The findings also indicate that sociodemographic factors, such as grade level and area of residence, significantly influence the QOL of children with hearing loss, suggesting that children in rural areas or in lower grade levels may face more challenges. The analysis demonstrated that role function, bodily pain, role emotion, and mental health were best predictors of hearing loss. The results also indicate that physical component summary was significant related with self-distraction coping and mental component summary was reported as significantly associated with self-distraction and acceptance coping strategy. To improve the QOL and coping strategies of children with hearing loss in Saudi Arabia, early identification and intervention are essential. Implementing mandatory newborn hearing screening and strengthening early intervention services, including speech therapy and auditory training, can mitigate the impact on communication and education. Schools should integrate individualized education plans (IEPs), provide teacher training in inclusive strategies, and establish mental health programs to support emotional well-being. Enhancing coping mechanisms through school-based programs, family counseling, and peer support groups can foster adaptive strategies and reduce social isolation. Public awareness campaigns should combat stigma and promote inclusivity, while ensuring affordability and accessibility of assistive devices, especially in rural areas. Policy and healthcare improvements should include national guidelines for hearing loss management, stronger collaboration between educators and healthcare providers, and longitudinal studies to assess intervention outcomes. These measures will collectively enhance the well-being and educational opportunities of children with hearing loss in Saudi Arabia.

Data Sharing Statement

The Data that support our findings can be found by directly asking the corresponding author.

Informed Consent Statement

Informed consent was obtained from all the participants involved in the study.

Institutional Review Board Statement

This study was conducted in accordance with the Declaration of Helsinki and approved by the Deanship of Scientific Research King Faisal University, Saudi Arabia. (KFU-REC-2023-SEP-ETHICS1350).

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Disclosure

The author declares no conflicts of interest in this work.

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