



Impact of a Structured Teaching Program on Primary School Teachers' Knowledge and Class Performance Regarding Attention-Deficit/Hyperactivity Disorder (ADHD) in Sulaimani City

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Abstract Background and Aim: Primary school teachers play a critical role in identifying and managing students with Attention-Deficit/Hyperactivity Disorder (ADHD), yet many lack adequate training. This deficit can hinder effective classroom management and lead to poor education outcomes for affected children. This study aimed to evaluate the effectiveness of a structured teaching program on the improvement of teachers' knowledge and performance regarding ADHD in Sulaimani City, Iraq. **Method:** This quasi-experimental study with intervention and control groups was conducted between September 2024 and August 2025, including baseline assessment, post-intervention and follow-up phases. In selected public and private primary schools in Sulaimani City. A total of 175 teachers were recruited. Data were collected at baseline, immediately after the intervention and at follow-up using two standardized instruments: The Knowledge of Attention Deficit Disorder Scale (KADDS) and the Teacher Performance Scale on ADHD (TPS_ADHD), along with socio-demographic data. Data were analyzed using SPSS version 26.0. Descriptive statistics, chi-square tests, independent-samples t-test and mixed linear models were employed, with statistical significance set at $p < 0.05$. **Results:** The intervention group demonstrated significantly greater improvements in both knowledge and classroom performance than the control group ($p < 0.001$). The intervention groups' mean knowledge score increased from 33.51 at baseline to 69.21 immediately after the intervention and remained significantly higher than baseline at follow-up, with a mean of 59.98. Similarly, mean performance scores improved substantially from 29.15 at baseline to 65.43 immediately after the intervention and 67.00 at follow-up. Linear mixed model analysis demonstrated significant effects of group, time and group×time interaction on both knowledge and performance ($p < 0.001$). **Conclusion:** A structured teaching program has a clear positive impact on primary school teachers' understanding of ADHD and their ability to manage related challenges in the classroom. Introducing organized, school-based training initiatives could serve as a feasible and effective approach to building teacher competence in supporting students with ADHD, especially in educational environments with limited resources.

Key Words ADHD, Primary School Teachers, Teacher Knowledge, Performance, Training Program, Iraq, Structured Intervention

INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neurodevelopmental condition that has historically faced inconsistent identification and insufficient attention in both clinical and educational settings. Differences in diagnostic criteria, along with a lack of population-level data from community studies, have led to broad global estimates,

suggesting that 84-132 million children worldwide live with ADHD [1,2]. Recent umbrella review estimates the overall prevalence among school-aged children at around 8.0%, although estimates vary according to diagnostic criteria, method of assessments and setting of study [3]. While ADHD affects children across all socioeconomic and geographic backgrounds, its consequences are more severe

in resource-limited environments where early detection and support systems are often lacking [4]. In Iraq, for example, fewer than 10% of teachers report having received formal training on behavioral disorders like ADHD, contributing to its reputation as “the most under-identified condition in primary education” [5].

ADHD differs from other learning challenges in that it involves a persistent pattern of inattention and/or hyperactivity-impulsivity that disrupts daily functioning or development. Affected children often struggle with focus, organization, restlessness and impulse control-behaviors that are frequently mistaken for disobedience or poor discipline [6]. In classrooms, these traits can lead to repeated disciplinary actions, social isolation and strained relationships with teachers, especially when educators lack training in behavior management [7]. Without proper recognition, ADHD symptoms may result in academic failure, classroom disruption and diminished self-esteem. Teachers without adequate preparation are less likely to apply supportive strategies-such as structured routines, active engagement and positive reinforcement-which can worsen behavioral issues and encourage inappropriate responses [7]. Studies in Low- and Middle-Income Countries (LMICs) indicate that up to 60% of teachers associate ADHD behaviors with inadequate parenting, highlighting widespread misunderstanding. Without appropriate educational support, children with ADHD face long-term difficulties in learning, social integration and emotional well-being, with school dropout rates surpassing 70% in some disadvantaged areas [8].

Current best practices for managing ADHD recommend a multimodal approach combining medication, behavioral therapy, family involvement and school-based accommodations. However, in many LMICs, access to medication is limited and behavioral interventions are often out of reach due to cost or availability [9]. In Iraq, stimulant medications like methylphenidate are seldom prescribed in public health facilities and child mental health services are largely confined to major cities [10]. Although teacher-led classroom strategies are recognized as effective non-drug interventions, structured professional development programs remain rare and poorly funded in many education systems [11]. Even where policies support inclusive education, teachers often lack the tools, confidence or understanding needed to apply evidence-based methods effectively [12]. Emerging initiatives-such as school-based training modules and peer-supported learning models-show promise in closing this gap by providing practical skills and knowledge [13]. A pilot project in southern Iraq found that short training workshops significantly improved teachers' ability to recognize ADHD symptoms and use appropriate behavior management techniques [14]. These approaches offer scalable, low-cost solutions, though challenges related to consistency and sustained impact persist [15].

With ADHD prevalence rising and limited opportunities for teacher training in primary education systems [16], targeted interventions focused on ADHD awareness,

symptom identification and classroom strategies have shown potential in improving both teacher competence and student outcomes [17]. There is also growing evidence that interactive training methods are more effective than passive instruction, leading to better knowledge retention and measurable improvements in classroom practice [18]. Despite increasing global recognition of ADHD and the important role teachers play in supporting affected students, there remains little documented implementation of structured ADHD training for primary school educators in Iraq and similar underserved contexts. Moreover, there is limited understanding of how lasting such training effects are on teacher knowledge and actual classroom performance. To address this gap, the present study developed and delivered a structured teaching program in Sulaimani City, aiming to evaluate its effectiveness in enhancing primary school teachers' understanding of ADHD and their self-reported ability to manage it in the classroom.

Research Question

- Does a structured teaching program improve primary school teachers' knowledge regarding ADHD?
- Does the structured teaching program improve teachers' classroom performance and management practices related to ADHD?

Study Design, Setting

This quasi-experimental study with intervention and control groups was conducted using a multi-stage cluster sampling method from September 1, 2024, to August 2025, in selected public and private basic schools in Suleimani City, Iraq. Schools were eligible for inclusion if they had at least one child with a confirmed diagnosis of ADHD documented through official medical reports obtained from the General Directorate of Education in Suleimani. Eligible teachers were recruited from these schools and assigned to either the intervention or control group according to the group allocation of their respective school.

Sample Size

The sample size was determined based on a multi-stage cluster sampling approach and the availability of eligible teachers in schools with identified ADHD interventions. A total of 175 teachers participated in the study, with 87 teachers allocated to the intervention group and 88 to the control group. This distribution allowed for meaningful comparison for pre- and post-intervention outcomes related to teachers' knowledge and performance regarding ADHD.

Schools were distributed across the educational directorates as follows: 51 schools in the Western Directorate, 31 schools in the Eastern Directorate and 4 private schools. Proportional allocation was used to determine the number of schools selected from each directorate: Western Directorate: $(51/86) \times 61 \approx 36$ schools, Eastern Directorate: $(31/86) \times 61 \approx 22$ schools and Private Directorate: $(4/86) \times 61 \approx 3$ schools.

Inclusion/Exclusion

The inclusion criteria included primary school teachers who were actively teaching during the study period, worked in schools that had at least one student diagnosed with ADHD and agreed to participate in the study. Teachers who were absent during data collection or did not complete the study questionnaire were excluded.

Multi stage cluster sampling procedure was used to select the participating schools. Eligible schools were first stratified by geographic educational zone and school types and a proportionate number was randomly selected from each stratum. The selected schools were then allocated non-randomly at the school level to either the intervention or control group. All participating teachers within the same school were assigned to the same study group; therefore, intervention and control participants were not recruited from the same school. Geographic balance and sufficient separation between the groups were maintained to minimize information sharing and contamination.

Study Tools and Data Collection

Data were collected using a structured, self-administered questionnaire comprising three sections:

- The first section collected participants' sociodemographic and professional characteristics, including age, gender, educational level, years of teaching experience, previous ADHD-related training and school type (Public or Private)
- The second part used the Knowledge of Attention Deficit Disorders Scale (KADDS), initially created by Sciutto *et al.* [19] and modified for this study after review by experts. It consists of 50 statements assessing teachers' understanding, beliefs and common misconceptions about ADHD. Respondents indicated whether each statement was "True," "False," or "Don't Know." A correct answer received 1 point, while incorrect answers or "Don't Know" responses received 0
- The third section measured teaching performance through the Teacher Performance Scale on ADHD (TPS-ADHD), which includes 11 items evaluating classroom strategies and management techniques used with students who have ADHD. Responses were given on a 5-point Likert scale from "Strongly Disagree" to "Strongly Agree," with higher totals reflecting more effective practices

The questionnaire was translated into Kurdish and Arabic using a forward-backward translation method to maintain accuracy in both language and meaning. Data collection took place via face-to-face interviews with eligible participants, each lasting about 15-20 minutes.

Scoring System and Interpretation

In this research, a number of domains were assessed using existing structured scoring systems providing total scores

and interpretations based on Bloom's cut-off points. Interpretation: Scores in all domains were interpreted using Original Bloom's cut-off points, with some studies referring to Modified Bloom's cut-off points:

- Good: 75-100% of total score
- Fair: 50-74% of total score
- Poor: <50% of total score

Pilot Study

A pilot study was conducted with 13 primary school teachers to evaluate the clarity, reliability and validity of the study instrument. Internal consistency reliability was assessed using Cronbach's alpha, demonstrating excellent reliability for both tools ($\alpha = 0.93$ for the KADDS and $\alpha = 0.92$ for the performance scale). Additionally, the instrument was reviewed by 14 nursing professors from various specialties to ensure content and face validity, clarity and relevance. Data obtained from the pilot study were excluded from the final analysis.

Ethical Approval and Informed Consent

This study was conducted in accordance with ethical principles of the Declaration of Helsinki and was approved by the College of Nursing Ethics Committee at Hawler Medical University (Approval code: 2575, dated August 6, 2024). Written informed consent was obtained from all participants after providing a full explanation of study objectives, ensuring confidentiality and emphasizing the voluntariness of participation.

Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp, Armonk, NY). Categorical variables, including sociodemographic characteristics, baseline ADHD awareness and teachers' observations of students' academic and social functioning were summarized using frequencies and percentages. Continuous variables such as age, year of teaching experience and knowledge and performance scores were presented as means with Standard Deviations (SD).

Baseline comparisons between the intervention and control groups were conducted using the chi-square test for categorical variables and the independent t-test for continuous variables to assess group equivalence prior to the intervention.

To evaluate changes in teachers' ADHD knowledge and classroom performance over time, Linear Mixed Models (LMMs) were fitted separately for the knowledge and performance scores. Each model included group (intervention vs. control), time (pretest, posttest 1 and posttest 2) and the group×time interaction as fixed effects. The group×time interaction was used to determine whether changes in outcomes over time differ in a structured teaching program. Type III tests of fixed effects were used to assess statistical significance and estimated marginal means were used to examine changes across assessment time points. Statistical significance was set at $p < 0.05$.

RESULT

Demographic Characteristics of Participants

A total of 175 primary school teachers participated in the study, comprising 87 in the intervention group and 88 in the control group. The overall mean age of participants was 40.15 ± 10.05 years in the intervention group and 42.88 ± 9.14 years in the control group. Most teachers were female, with 75 (86.21%) in the intervention group and 76 (86.36%) in the control group, with a mean experience of 15.17 ± 10.74 years of the intervention group and 18.22 ± 10.65 years of the control. In terms of education level, nearly half of the intervention group held a bachelor's degree (48.28%). While the control group had a slightly higher proportion with institute Diplomas (52.27%). Detailed demographics and Variables are presented in Table 1.

Awareness and Exposure to ADHD Prior to the Program

The results showed that over half of teachers had previously heard about ADHD, including 47 teachers (54.02%) in the intervention group and 54 teachers (61.36%) in the control group. However, this difference was not statistically significant ($p = 0.33$). Among those who had heard of ADHD, the most common sources were professional training or workshops (14.94% intervention vs. 9.09% control) and learning at school (11.49% intervention vs. 14.77% control), While fewer cited social media, books or TV. A large proportion reported never seeking information about ADHD (24.14% intervention 30.68% control) Or only doing so when needed. Notably, only sixteen teachers (18.39%) in the intervention group and 14 (15.91%) The control group had received any training on ADHD ($p = 0.66$). Most teachers also reported on ADHD special staff at their schools (77.01% intervention, 75.00% control). In terms of self-related knowledge,

83% in a both groups indicated "No knowledge", While extensive knowledge was rare (1.15% intervention vs. 5.68 control) (Table 2).

Teachers' Observations of ADHD Students' Academic and Social Functioning

The majority of students with ADHD were perceived to have below-average academic performance, with 72 teachers (31.03%) in the intervention group and 30 (34.09%) India control group rating them below average and about 24% in both groups reporting average performance. Only a small proportion rated. Regarding concentration, most teachers observed that students with ADHD "Often" struggled in class (41.38% intervention, 38.64% control) and about 10% in each group reported that their students "Always" struggled. Participation in extracurricular activities was low across both groups. With only 18.39% in the intervention group and 18.18% in the control group reporting engagement. In term of her relationships, over 70% of the intervention group teachers and nearly 64% in the control group observed that ADHD students did not have close friends at school. Furthermore, only 7 teachers (8.05%) in each group Stated that their students never appeared social isolated (Table 3).

Comparison of Total Score Mean Rate of Knowledge and Performance Between the Case and Control Groups at Each Assessment Time

The comparison displayed in Table 4 regarding the knowledge and performance total score mean in both groups at the three-time assessment illustrated a strong effect of the intervention. At baseline, both groups showed it comparable knowledge scores (33.51 ± 21.53 vs. 34.14 ± 25.05 , $p > 0.05$) and performance scores (29.15 ± 16.21 vs. 31.11 ± 18.32 ,

Table 1: Socio-Demographic Characteristics of Primary School Teachers in the Case and Control Groups (N = 175)

Socio-Demographic Characteristics		Case Frequency (%)	Control Frequency (%)	p-value
Age (Years)	<30	17(19.54)	9(10.23)	0.065
	30-40	29(33.33)	23(26.14)	
	>40	41(47.13)	56(63.63)	
	Mean±S.D	40.15±10.05	42.88±9.14	
Gender	Male	12(13.79)	12(13.64)	0.976
	Female	75(86.21)	76(86.36)	
Years experiences as teaching (Years)	<5	19(21.84)	13(14.77)	0.133
	5-10	15(17.24)	9(10.23)	
	>10	53(60.92)	66(75.00)	
	Mean±S.D	15.17±10.74	18.22±10.65	
Subject for teach	Arabic	4(4.60)	5(5.68)	0.945
	English	12(13.79)	12(13.64)	
	Kurdish	22(25.29)	26(29.55)	
	Math	15(17.24)	17(19.32)	
	Science	15(17.24)	10(11.36)	
	Social	4(4.60)	3(3.41)	
	social worker	15(17.24)	15(17.04)	
Level of education	Bachelor's Degree	42(48.28)	29(32.95)	0.064
	Institute Diploma	40(45.98)	46(52.27)	
	Graduate Diploma	0(0.00)	2(2.27)	
	Master's Degree	2(2.30)	1(1.14)	
	Elementary Education	3(3.45)	10(11.37)	
Total		87(100)	88(100)	

Chi-square test was used for categorical variables, All p-values are two-tailed; $p < 0.05$ was considered statistically significant

Table 2: Information of Teachers Dealing with ADHD Children Before the Teaching Program

Information of Teachers		Case	Control	p-value	
		Frequency (%)	Frequency (%)		
Heard about ADHD		Yes	47 (54.02)	54 (61.36)	0.326
		No	40 (45.98)	34 (38.64)	
If yes	Where did you first learn about ADHD	No	40 (45.98)	34 (38.64)	0.085
		Education curriculum	9 (10.34)	5 (5.68)	
		Social media	5 (5.75)	17 (19.32)	
		Books	3 (3.45)	7 (7.95)	
		TV or radio	4 (4.60)	3 (3.41)	
		Internet search	3 (3.45)	1 (1.14)	
		Professional training or workshop	13 (14.94)	8 (9.09)	
		At school	10 (11.49)	13 (14.77)	
	How often do you seek information about ADHD	No	40 (45.98)	34 (38.64)	0.661
		Never	21 (24.14)	27 (30.68)	
		Only when needed for specific purposes	10 (11.49)	10 (11.36)	
		Rarely (a few times a year)	6 (6.90)	5 (5.68)	
		Occasionally (once a month)	3 (3.45)	7 (7.95)	
		Regularly (once a week or more)	7 (8.05)	5 (5.68)	
Any additional training regarding ADHD since you began teaching		Yes	16 (18.39)	14 (15.91)	0.663
		No	71 (81.61)	74 (84.09)	
School have specialists or staff dedicated to helping children with ADHD		Yes	20 (22.99)	21 (23.86)	0.858
		No	67 (77.01)	66 (75.00)	
On a scale from 1 to 10, how would you rate your knowledge about ADHD		No Knowledge	73 (83.91)	74 (84.09)	0.183
		Moderate Knowledge	13 (14.94)	9 (10.23)	
		Extensive Knowledge	1 (1.15)	5 (5.68)	
Type of school do you teach in		Public	78 (89.66)	80 (90.91)	0.779
		Private	9 (10.34)	8 (9.09)	
The primary language of instruction at your school		Kurdish	77 (88.51)	80 (90.91)	0.601
		English	10 (11.49)	8 (9.09)	
School provide sufficient resources and support to help teachers manage students with ADHD		Yes	8 (9.20)	13 (14.77)	0.520
		No	55 (63.22)	53 (60.23)	
		Unsure	24 (27.59)	22 (25.00)	
Total		87(100)	88(100)		

Chi-square test was used for categorical variables, All p-values are two-tailed; $p < 0.05$ considered statistically significant

Table 3: Teachers' Observations of School and Social Experiences of ADHD Students Before the Teaching Program

Teachers' Observations of School and Social Experiences of ADHD Students		Case	Control	p-value
		Frequency (%)	Frequency (%)	
assess the overall academic performance of students with ADHD	Poor	20(22.99)	15(17.05)	0.783
	Below average	27(31.03)	30(34.09)	
	Average	21(24.14)	20(22.73)	
	Good	15(17.24)	16(18.18)	
	Excellent	4(4.60)	7(7.95)	
students with ADHD struggle with concentration in class	Never	9(10.34)	7(7.95)	0.800
	Rarely	13(14.94)	11(12.50)	
	Sometimes	20(22.99)	22(25.00)	
	Often	36(41.38)	34(38.64)	
	Always	9(10.34)	14(15.91)	
students with ADHD participate in extracurricular activities	Yes	16(18.39)	16(18.18)	0.971
	No	71(81.61)	72(81.82)	
students with ADHD have close friends at school	Yes	24(27.59)	32(36.36)	0.213
	No	63(72.41)	56(63.64)	
students with ADHD appear socially isolated	Never	7(8.05)	7(7.95)	0.204
	Rarely	23(26.44)	19(21.59)	
	Sometimes	29(33.33)	27(30.68)	
	Often	25(28.74)	23(26.14)	
	Always	3(3.45)	12(13.64)	
Total		87(100)	88(100)	

Chi-square test was used for categorical variables, All p-values are two-tailed; $p < 0.05$ considered statistically significant

$p > 0.05$), indicating that there was no significant difference between the two groups before the intervention. After implementing the intervention, the intervention obtained better results in both scores. At post 1, the intervention recorded an average knowledge score of 69.21 ± 10.10 vs. 35.17 ± 27.45 achieved by the control group ($p < 0.001$) And

the average performance score of the intervention was 65.43 ± 11.41 compared to 32.44 ± 17.97 Achieved by the control group ($p < 0.001$). Similar results were observed at the post-test 2 showing that the intervention produced significantly improved knowledge and performance scores (Table 4).

Table 4: Comparison of Total Score Mean Rate of Knowledge and Performance Between the Case and Control Groups at Each Assessment Time

Time	Knowledge			Performance		
	Case (Mean±S.D)	Control (Mean±S.D)	p-value	Case (Mean±S.D)	Control (Mean±S.D)	p-value
Pre	33.51±21.53	34.14±25.05	>0.05	29.15±16.21	31.11±18.32	>0.05
Post 1	69.21±10.10	35.17±27.45	<0.001	65.43±11.41	32.44±17.97	<0.001
Post 2	59.98±10.92	34.52±27.11	<0.001	67.00±11.01	32.25±17.98	<0.001

Mean is Total score rate

Table 5: Type III Test of Fixed Effects for Knowledge and Performance Scores

Effect	Knowledge			Performance		
	df	F	p-value	df	F	p-value
Group	1,163	37.217	<0.001	1,163	86.997	<0.001
Time	2,163	193.708	<0.001	2,163	313.443	<0.001
Group×Time	2,163	167.012	<0.001	2,163	283.753	<0.001

Mixed linear model was using this result

Effect of Structured Teaching Program on Teachers' Knowledge and Performance over Time: Linear Mixed Model Analysis

Table 5 presents the results of the Type III fixed effective tests, which suggest a significant effect of group, time and the interaction on knowledge as well as performance scoring using a mixed linear model. In terms of knowledge, there was a significant main effect of group ($F = 37.217$, $p < 0.001$) And tying ($F = 193.708$, $p < 0.001$) were present, indicating considerable group differences and time changes regarding knowledge. the same is applicable to the group×time interaction effect ($F = 167.012$, $p < 0.001$), Which shows that the changes in knowledge across the time periods were not similar in the two groups, thus indicating the effectiveness of the intervention applied. The same trend is observed for performance score with considerable effect of group ($F = 86.997$, $p < 0.001$), time group ($F = 313.443$, $p < 0.001$) and their interaction group ($F = 283.753$, $p < 0.001$) found (Table 5).

DISCUSSION

This study assessed the effectiveness of a structured teaching program in improving primary school teachers' understanding and classroom practices related to Attention-Deficit/Hyperactivity Disorder (ADHD) in Suleimani City. Results indicated a clear positive impact, with notable gains in both knowledge and classroom performance following the intervention.

As key figures in early identification and classroom support, primary school teachers play a critical role in addressing ADHD. Yet many lack sufficient training to meet the needs of affected students. While awareness of ADHD is increasing worldwide, there remains limited research on teacher readiness in Iraq's Kurdistan Region, where access to educational resources and specialist services is limited. This mismatch between growing student needs and inadequate teacher preparation creates ongoing challenges in classrooms. To address this, the current study focused on strengthening teachers' ADHD-related competencies through a targeted training program.

The participants were mostly female, with over ten years of teaching experience-a profile that mirrors the broader

primary education workforce in the region. This gender distribution aligns with global patterns, where women dominate the profession. The high proportion of experienced educators provides insight into how long-serving teachers engage with professional development in specialized areas. Additionally, differences in academic qualifications-nearly half of the intervention group holding bachelor's degrees compared to more institute diplomas in the control group-reflect the varied educational backgrounds common in developing education systems. With an average age of around 40 in both groups, the cohort represents a relatively mature teaching population, which may affect openness to new teaching methods and behavior management techniques. These demographic patterns are consistent with earlier studies in Iraq, which also found a predominance of female teachers and a mean age near 41, along with a concentration in the 36-45 age range [20,21]. Such similarities suggest the findings may be applicable to other settings within the region.

Initial assessments uncovered significant deficits in ADHD knowledge and training access. More than 80% of teachers reported no prior understanding of the disorder and fewer than 20% had received formal instruction. These results echo earlier findings by Flanigan and Climie, who noted widespread gaps in educator awareness [22]. In contrast, a study in Saudi Arabia by Alanazi and Turki found only 8% of teachers unfamiliar with ADHD, with about 77% having attended relevant training [23]. The absence of ADHD specialists in roughly three-quarters of Suleimani schools further compounds the issue, leaving teachers without essential support. Teachers also reported observing substantial academic and social struggles among students with ADHD, such as difficulty concentrating, lower academic performance and poor peer relationships. Over 70% noted that these students often lacked close friendships-a finding supported by international research highlighting the social challenges linked to ADHD [24]. Collectively, these results underscore the pressing need for comprehensive training programs that equip teachers to support both the academic and social needs of students with ADHD.

The Structured Teaching program was improving teachers' overall ADHD-related knowledge. At baseline, the

intervention and control groups had comparable knowledge scores with no statistically significant difference between them. Following the program, the mean knowledge score in the intervention group increased from 33.51 (pretest) to 69.21 immediately after the intervention. Although the score decreased to 59.98 after follow-up, it remained substantially higher than the baseline score. In contrast, the control groups show little change across three assessments. The differences between the intervention and control groups were statistically significant at both post-tests. These findings are consistent with previous intervention studies demonstrating the effectiveness of a target professional development program in improving teachers' ADHD-related knowledge and competence [25]. Similarly, Lora reported that a structured teaching program significantly improved primary school teachers' knowledge regarding ADHD [26]. Shehata et al. also found that a structured teaching program had a significant positive effect on teachers' knowledge of ADHD [27].

Teacher performance also improves following the structured teaching program at baseline. The intervention and control groups had comparable mean performance scores, with no statistically significant difference between them. In the intervention group, the main performance score increased from 29.15 at pre-test to 65.43 immediately after the intervention and remained high at follow up, which is a further increase to 67.00. In contrast, the control group showed only minimal changes across the three assessment periods. The differences between the intervention and control groups were statistically significant at both post-tests. These findings suggested that the teachers were able to apply the knowledge and skills acquired through the program to the classroom performance. This finding is consistent with Shehata et al., who reported significant improvement in teachers' behavioral management practice following an ADHD teaching program [27]. Ward et al. Also found that the teacher-training program could improve teachers' behavior and their management of students with ADHD-related behaviors [28].

The linear mixed model shows a statistically significant effect of group, time and the interaction between group and time for both teacher knowledge and performance. The significant group-by-time interaction is particularly important because it indicates that change across the three assessments differed between intervention and control groups. Teachers in the intervention group showed substantial improvements. Following the structure teaching program, whereas, scores in the control group remain relatively stable over time. This finding is consistent with the systematic review and meta-analysis which found that ADHD teacher training program significantly improved teachers' knowledge, particularly immediately after training, although some deterioration was observed during follow-up [28]. Similarly, another study reported significant improvements in primary school teachers' ADHD knowledge and self-efficacy following an in-service training

program [29]. Also, both outcomes decreased slightly at the 1 month follow-up; they remain significantly higher than their baseline levels. More recently, study found that a controlled ADHD training program improved primary school teacher's knowledge of ADHD and behavioral interventions compared with a wait-list control group [30]. These findings are consistent with the present study and indicate that structured ADHD training can produce greater improvements in teachers' knowledge and classroom-related performance than those observed in teachers who do not receive the intervention.

Although this study offers valuable insights, several limitations must be recognized. First, the quasi-experimental design, while well-suited to real-world educational environments, restricts the strength of causal conclusions when compared to randomized controlled trials. Second, the research was carried out in a single region within the Kurdistan area, which may affect the extent to which results can be applied to other geographic and cultural settings. Third, teacher performance was assessed through self-reported data rather than direct classroom observation, raising the possibility of response bias. Future studies should adopt randomized methodologies, involve multiple regions and include observational assessments of teaching practices to confirm and build upon these results.

CONCLUSIONS

The findings indicate that introducing a structured, school-based training program can effectively enhance primary school teachers' understanding of ADHD and their classroom performance. The program contributed to better teaching performance and improved educational support for students with ADHD, particularly in under-resourced settings. These results support the integration of structured ADHD training into regular teacher professional development efforts to strengthen both knowledge and instructional effectiveness in this area.

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Ethical Approval and Consent to Participant

This study was conducted in accordance with ethical principles of the Declaration of Helsinki and was approved by the College of Nursing Ethics Committee at Hawler Medical University (Approval code: 2575, dated August 6, 2024). Written informed consent was obtained from all participants after providing a full explanation of study objectives, ensuring confidentiality and emphasizing the voluntariness of participation.

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