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Research Article

1-Brain Health As an Integrant of Primary Medical Care in Hard to Reach Financially Deprived District in South Punjab -Pakistan

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Abstract

Purpose: To report the five-dimension factors proposed by the World Health Organization (WHO) influencing adherence to antiseizure medicines (ASMs) in children with epilepsy (CWE) in financially disadvantaged areas, focusing on removing these barriers for improved ASMs adherence among CWE.

Methods: A research investigation was carried out from September 2022 to December 2022, involving a total of 280 children diagnosed with epilepsy: age from 6 months to 18 years visiting monthly paediatric neurology clinics at the Rukhsana Shafqat Urban Primary Health Centre (RSUPHC). The objectives of the study were to examine the factors that impact or facilitate adherence to ASMs among children with epilepsy (CWE). The data was obtained using Morisky's Medication Adherence Scale-8 (MMAS-8), as well as the identification of five-dimension factors proposed by the WHO that hinder or facilitate adherence to ASMs. The objective of the study was to offer complimentary consultations and provision of free ASMs to the CWE residing in economically deprived regions.

Results: The research encompassed a group of 280 individuals who were diagnosed with epilepsy: age of 10.82±6.32 years. Out of the whole sample, it was seen that 226(80.7%) children exhibited adherence to the treatment regimen as prescribed. Conversely, the remaining 54(19.3%) of children were categorised as nonadherent. The study demonstrated the noteworthy impact of socioeconomic factors, while also including all the parameters identified by the WHO that affect adherence to antiseizure medication. The availability and supply of complimentary paediatric neurology services were crucial in promoting adherence to antiseizure medication (ASM). **Conclusion:** Comprehensive treatments addressing both adherence and nonadherence to ASMs are needed to enhance the management of childhood epilepsy, with a focus on economically disadvantaged areas.

Kew Words: medication; adherence; self-report; epilepsy; seizures; polypharmacy; antiepileptic drugs (aeds); stigmatization

Introduction

Epilepsy is a crucial neurological disorder that significantly contributes to prolonged morbidity, disability, and substantial financial loss. Over 85% of the global burden of epilepsy occurs in the 49% of the population living in low-income and lower middle-income countries. [1] Cost-effective epilepsy treatments are available and an accurate diagnosis can be made without technological equipment. Nonetheless, a vast majority of individuals with epilepsy in many resource-poor regions do not receive treatment. [2–4] Untreated epilepsy is a critical public health issue, as people with untreated epilepsy face potentially devastating social consequences and poor health outcomes. Children and youth represent one of the fastest growing populations affected by epilepsy – the most common childhood neurological condition in the world. [5]

Negative effects on cognition and physical development, as well as social stigmatization and poor quality of life, are commonly observed in children with epilepsy (CWE). Furthermore, CWE are at higher risk for developmental, intellectual and mental-health co-morbidities, including attention deficit/hyperactivity disorder (ADHD), autism, learning disabilities, depression and anxiety. [6–9] Often, the evaluation of a child with seizures starts with a pediatrician in a primary-care practice or an

emergency room. Children are then referred to a neurologist or epileptologist for further evaluation, family education and the development of a management plan. Unfortunately, treatment and referral patterns for CWE are not uniform or standardized across the developing countries and is not exiting in hard-to-reach financially deprived areas in these countries.

A lot of disparities are found within these countries, particularly between the poorer areas (rural or urban settlement) and more affluent urban areas and between the scarcity of health facilities and personnel in the government sector and those in the private medical sector. These disparities contribute to the enormous treatment gap (i.e., the pro portion of people with epilepsy who have active epilepsy but who are not taking antiepileptic drugs [AEDs] or are inadequately treated): over 60% of people with epilepsy do not access biomedical treatment for epilepsy in low middle income countries (LMIC), and if they do, they often do not or are not able to adhere to the prescribed regimens. [10, 11] Decades of work have gone into identifying and bringing to light treatment gaps in epilepsy. Despite this work, progress to significantly narrow care divides has been slow. However, significant barriers remain. Even people in high income countries continue to experience barriers to care such as a lack of specialists, underutilization of epilepsy surgery, and variable resource allocation.[12] Despite this concerted effort by different stakeholders, there are no systematic efforts/projects for financially deprived hard to reach areas in Pakistan. We started an outreach brain health program for such an area (District Bhakkar) and this report gives effects of our decades efforts in bridging the gaps of childhood epilepsy management.

2-Methods

2. i Study Area and Design

This prospective, longitudinal, cross-sectional investigation used descriptive and correlation analyses. The investigation was done in a charity urban primary care facility (CUPHCF) for outpatient clinics for brain subspecialties. The facility is in Bhakkar, a poor difficult to reach district city in South Punjab, Pakistan. This city is 440 miles from Lahore and takes 6 hours to drive because to terrible road conditions. The CUPHCF is the district's only brain health care centre and takes referrals from public and private clinics. Undiagnosed CWE make up over 60% of paediatric neurology referrals. This facility is situated adjacent to the District Headquarters Hospital. The canter's brain subspecialists travel from Lahore, Multan, and Faisalabad, Punjab's largest cities to treat children and adults in this facility in addition to their brain health outreach program. This effort helps teenagers transition to adult brain health program for epilepsy management. Clinical criteria from the International League Against Epilepsy (ILAE) was used to diagnose childhood epilepsy. These criteria included children between 9 months and 18 years old, regardless of gender, who had no major cognitive impairment or active psychiatric illnesses. This health facility treats childhood epilepsy and the subjects of this investigation included CWE in whom at least one ASM was started ≥3 months before this investigation. A qualified consultant paediatric neurologist or neuropsychiatrist enrolled research participants. EEG and neuroradiology imaging studies like CT and MRI provided corroborative data in the diagnosis process, although they were not essential. The research included verbal consenting patients and carers. These inclusion criteria were essential to ensure that caretakers and patients could understand and answer research instrument questions. Rapidly advancing neurological or medical problems, psychological conditions that could hinder participation and cause discontent, and non-epileptic psychogenic seizures were excluded.

2. ii Study Population, Variables and Outcome Endpoints

The major outcomes of the study included drug adherence, non-adherence, and the factors that either helped or impeded adherence to CE medication. The present study assessed the level of adherence to ASMs in a cohort including 340 children who had ascertained a diagnosis of epilepsy. The children in question were receiving medical treatment and participated in monthly outpatient sessions in the field of pediatric neurology at RSUPHC from September to December 2022. Upon careful examination, it was determined that a grand total of 280 instances met the predetermined criteria for inclusion in the study. Consequently, all children with epilepsy who participated in these four monthly outpatient pediatric neurology sessions were categorized into adherent and nonadherent groups.

3. iii Study Tools for Data Collection Process and Management

Two recently joined consultant pediatric neurologists collected data from primary caretakers. Two RSUPHC-employed physicians, two neurology nurses, two computer operators, and one psychologist formed the research team. The lead investigator oversaw them. The team used a pre-tested interviewer-administered semi-structured questionnaire from study materials and related literature. Everyone who matched the eligibility criteria gave informed verbal consent after receiving a detailed study briefing. Patients who satisfied the criteria were interviewed after neurological follow-up. The data came from three-part questionnaires. The session began with epilepsy clinical facts and patients' and carers's sociodemographic. The MMAS-8 instrument collected medication adherence data in the second segment [13]. The third portion of the study examined factors affecting prescription antiseizure drug adherence. The WHO, s classified five groups of decreased adherences were used ;1) socioeconomic variables,2) healthcare team and system factors,3) disease factors, 4) medication factors,5) and patient related factors are included. This study attempted to determine the prevalence of antiseizure medication (ASM) non-adherence and its associated factors among CWE.

3. Results

3.i. Base line demographic and clinical characteristics of the participants associated with adherence/nonadherence to ASMs among CWE.

Out of 294 eligible CWE contacted to participate in the study, 10 (3.4%) declined and 4 (1.36%) withdrew during the interview procedure (response rate (95%). This study monitored 280 epileptic children and adolescents. The eliminated participants shared traits with the cohort. 280 consecutive children with epilepsy who were started ASMs at least 3 months before to enrollment in this experiment and their carers met the inclusion criteria. The average age of research participants was 10.24±6.32 yrs., ranging from 6 months to 18 years. The sample was 56% male, and all of these youngsters were born in District Bhakkar. According to the Medication Adherence Scale-8 (MMAS-8), 226 patients (80.7% of the sample) adhered to the indicated anti-seizure medication (ASM) therapy. The ASM(s) therapy was non-adherent in 54 patients (19.3% of the study). Out of 153 school-aged youngsters, 41.2% were not attending. This proportion was broken into two categories: 19.6% of the youngsters never attended school, while 21.6% dropped out. The remaining 58.8% of children were actively studying. Among the CWE carers, 210 (75% of the sample) were mothers. 45 (16% of the sample) were dads, and 25 (9% of the sample) were other close relatives. Co-carers were helping in 240 participants (85.7%). Age and gender did not affect antiseizure drug nonadherence. However, remote living, not attending school, and having a non-primary carer mother were connected to ASM nonadherence (Table 1).

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	Total	280	100%	226 (80.7%)	54(19.3%)
2	Child's Gender	Male	157(56%)	129(82%)	28(18%)
		Female	123(44%)	97(78.8%)	26(21.2%)
3	Child's Age	≥Mon to 2 yrs.	67- 24 %	55 (82%)	12 (18%)

		>2Yrs to 6 Yrs.	60-21.4 %	48 (80%)	12 (20%)
		>6Yrs to 10Yrs	60-21.4 %	48 (80%)	12 (20%)
		>10Yrs to 18Yrs	75-26.8 %	59 (79%)	16 (21%)
4	Residence location	Urban/semi urban	170-60.7%	142(83.5%)	28(16.5%)
		Rural	110-39.3%	84(76.4%)	26(23.6%)
5	Educational status of the child (≥6yrs of age), 153 (100%)	Did not join school	30(19.6%)	22(73.3%)	8(26.7%)
		Dropped from school/college	33(21.6%)	23(69.7%)	10(30.3%)
		Going to school/college	90(58.8%) %	80(88.8%)	10(11.2%)
6	Primary Caregivers' Relationship	Mother	210-75%	176(84%)	34(16%)
		Father	45-16%	33(73.3%)	12(26.7%)
		Others	25-9%	17(68%)	8(32%)

Table 1. Base line sociodemographic characteristics of study cohort, no 280(100%).

3. ii. Socio-economic& Cost-related factors associated with adherence/nonadherence to ASMs

This study found no association between ASM nonadherence and parental monthly income below 10,000 or over 50,000 Pakistani Rupees, but we are providing free brain health care services in this charity heath facility. Illiteracy among parents was a possible risk for nonadherence, but our statistical analysis found no significant link. Non-adherence to antiepileptic medicine (ASM) regimens was 2.4 times greater in children with epilepsy whose parents expressed financial difficulty due to treatment. Table 2 shows no statistically significant link between nonadherence and high family size (>5family members).

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	Total	280	100%	226 (80.7%)	54(19.3%)
2	Parents'/Carers' monthly income in Pak. Rupees	≤5000	80 (25%)	64(80%)	16(20%)
		≥ 5000 to 10000	90(32%)	72(80%)	18(20%)
		≥10000 to 30000	60 (28.6 %)	50 (83.3%)	10 (16.7%)
		≥30000 to 50000	30 (10.8 %)	23 (76.7%)	7 (23.3%)
		≥50000	20 (3.6%)	17 (85%)	3 (15%)
5	Parents'/Carers' Educational status	Did not join school	40(14.3%)	28(70%)	12(30%)
		≤ Middle	80(28.6%)	62(77.5%)	18(22.5%)
		≥ Middle to ≤Matric	90(32.1%)	74(82.2%)	16(17.8%)
		≥Matric	70(25%)	62(88.6%)	8 (11.4%)
6	Parents'/Carers' Expression of financial difficulties in managing CE	Expressed no difficulty	210 (75%)	180(85.7%)	30(14.3%)
		Expressed difficulty	70(25%)	46(65.7%)	24 (34.3%)

Table 11: Socio-economic& Cost-related factors associated with adherence/nonadherence to ASMs, no 280(100%)

3.iii Health care team and system in place associated with adherence/ nonadherence to ASMs among CWE.

Thirty study participants (10.7%) travelled more than 30 kilometers to reach RSUPHC. Public transit was used by 66.6% of participants for commuting. There was a substantial link between ASM nonadherence and centre distance and time. Patients who went long distances were 3.3 times more likely to be nonadherent. In 80 (28.6%) of the sample took more than 2 hours to reach RSUPHC. These individuals were twice as likely to be nonadherent as the 70 participants (25%) who reached RSUPHC in less than 60 minutes. The study examined doctor-patient communication and antiseizure drug adherence. We found that 18% of subjects lacked adequate childhood epilepsy (CE) and treatment information. Communication between doctors and patients improved antiseizure drug adherence. Only 13% of patients who reported good doctor-patient communication were nonadherent to their ASMs, while 48% of those who reported poor communication were. The longer waiting time at this facility dissatisfied 70 individuals (25%) and had a 34.3% nonadherence rate. In contrast, 210 individuals (75%) had no waiting time complaints and had 14.3% nonadherence. A friendly attitude among healthcare workers is linked to drug adherence. However, our cohort data did not support this link statistically. The study revealed no association between pharmacy service accessibility and antiseizure medication adherence. Only 30 CWE (10.7%) received inadequate epilepsy and antiseizure drug counseling in our study sample. In this subgroup, 14 (46.7%) did not take their prescribed medications. The remaining 250 trial participants (89.3%) who got thorough counseling had 40 (16%) nonadherence (Table III).

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	Distance from neurology clinic (RSUPHC)	<10km	100-35.7%	88(88%)	12(12%)
		10-20KM	85-30.4%	73(76%)	12(14 %)
		20-30KM	65- 23.2%	55(84.5%)	10(15.4%)
		>30KM	30-10.7 %	18(60%)	12(40%)
2	Time taken from home to health facility	< 60 minutes	70(25%)	60(85.7%)	10(14.3%)
		1-2 Hours	130(46.4%)	110(84.6%)	20(15.4%)
		>2 Hours	80(28.6%)	56(70%)	24(30%)
3	Communication skills in healthcare professionals	Perfect and appropriate	230(82%)	200(87%)	30(13%)

		Imperfect and inappropriate	50(18%)	26(52%)	24(48%)
4	Waiting times	Short	210(75%)	180(85.7%)	30(14.3%)
		Long	70(25%)	46(65.7%)	24(34.3%)
5	Welcoming attitude of healthcare professionals	Yes	200(71.4%)	165(82.5%)	35(17.5%)
		No	80(28.6%)	61(76.25%)	19(23.75%)
6	Ease of access to pharmacy services	Good	210(75%)	170(81)	40(19%)
		Poor	70(25%)	56(80%)	14(20%)
7	Parental/patients'counseling.	Good counseling	250(89.3%)	210(84%)	40(16%)
		Poor counseling	30(10.7%)	16(53.3%)	14(46.7%)

Table 111: Health care team and system in place associated with adherence/ nonadherence to ASMs, no 280(100%)

3. iv. Disease-related factors associated with adherence/nonadherence to ASMs among CWE.

Inadequate seizure management was linked to nonadherence in physician evaluations. The study indicated that 60.7% of patients had well-controlled seizures, 21.4% had limited control, and 17.9% had uncontrolled seizures; with nonadherence 14.1%, 20% and 36%, respectively. Parental seizure management opinions differed little from medical opinions. Generalised epilepsy affected 200 patients (71.4%) with 15, unclassified epilepsy 50(17.9%) % and 28% and focal seizures 30(10.7%) with nonadherence 33.3% were documented in this study. Our cohorts included 220 (71.4%) epilepsy patients who had received treatment for more than two years. Antiseizure medication (ASM) duration did not affect adherence (Table- 4).

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	Physicians' assessment of seizure control	Controlled no seizures over last 3 months	170(60.7%)	146(85.9%)	24(14.1%)
		Partially controlled 1-2 per month	60(21.4%)	48(80%)	12(20%)
		Uncontrolled/worsened ≥ two seizure per month	50(17.9%)	32(64%)	18(36%)
2	Parents'/ Patients' perception of their seizure control	Controlled	150(53.6%)	130(86.7%)	20(13.3%)
		Partially controlled	70(25%)	56(80%)	14(20%)
		Uncontrolled/worsened	60(21.4%)	40(66.7%)	20(33.3%)
3	Seizure Type	Generalize seizure	200(71.4%)	170(85%)	30(15%)
		unclassified seizure	50(17.9%)	36(72%)	14(28%)
		Focal seizure	30(10.7%)	20(66.7%)	10(33.3%)
4	Disease duration	<1year	80(28.6%)	65(81.5%)	15(18.5%)
		≥1 Year to 2Years	120(42.8%)	95(79%)	25(21%)

Table 1V: Disease-related factors associated with adherence/ nonadherence to ASMs, no 280(100%)

3.v. Therapy-related factors associated with adherence/ nonadherence to ASMs among CWE.

In our study sample of 195(69.6%) participants on monotherapy had nonadherence in 13%, whereas, 85(30.4%) were receiving polytherapy and were nonadherent in 29% of the cases (Table 5 and 6). Three times a day of antimicrobial stewardship measures (ASMs) increased nonadherence thrice compared to once-a-day medication. Out of 190(67.9%) patients had no adverse effects, 60(21.4%) of patients reported fake and 30(10.7% had pharmacological side effects due to ASMs. Nonadherence was documented among 12.6%, 26.7% and 46.7%of these patients, respectively. Misconceptions about alternative and complementary medicine (ASM) were associated to nonadherence. In particular, 50% of the patients considering no efficacy of ASMs were nonadherent, 28.6% were nonadherent who believed in partial and only 14.1% had nonadherence believing in full efficacy of ASMs. Low treatment satisfaction was associated with 36.7% nonadherence, compared to 14.5% participants with high treatment satisfaction. Limited-knowledge of carers/ patients had a 30% nonadherence rate to antiseizure medicines. Patients with some understanding had a 22.5% nonadherence rate, whereas those with comprehensive knowledge had 15% (Table VI) nonadherence to antiseizure drugs (ASMs).

No	ASMs Treatment: Self-reported/Record checked	
Monotherapy (195, 69.6%)		
1	Carbamazepine	60(30.77%)
2	Valproic acid	45(23.07%)
3	Phenytoin	30(15.38%)
4	Levetiracetam	20(10.26%)
5	Phenobarbitone	20(10.26%)
6	Oxcarbamazepine	20(10.26%)
Polytherapy, ≥2ASMs (85, 30.4%)		
1	Carbamazepine and Valproic acid	25(29.4%)
2	Valproic acid and levetiracetam	20(23.5%)

3	Carbamazepine and phenobarbitone	16(18.8%)
4	Valproic acid+ Levetiracetam + Lamotrigine	14(16.5%)
5	Valproic acid+ Levetiracetam+ Topiramate	10(11.8%)

Table V. Patients receiving monotherapy and polytherapy with antiseizure medicines (ASMs) (n=280-100%)

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	No of drugs	Monotherapy	170(60.7%)	148(87%)	22(13%)
		Polytherapy	110 (39.3%)	78(71%)	32(29%)
2	Medication administration frequency	Once a day	40(14.2%)	36(90%)	04(10%)
		Twice a day	165(59%)	137(80%)	28(20%)
		≥3 Times a day	75(26.8%)	53(70.7%)	22(29.3%)
3	Adverse effects.	No adverse effects.	190(67.9%)	166(87.4%)	24(12.6%)
		Presumed adverse effects.	60(21.4%)	44(73.3%)	16(26.7%)
		Significant adverse effects.	30(10.7%)	16(53.3%)	14(46.7%)
4	Perceived drug efficacy	Good efficiency	170(60.7%)	146(85.9%)	24(14.1%)
		Partially efficient	70(25%)	50(71.4%)	20(28.6%)
		Not efficient	40(14.3%)	20(50%)	20(50%)
5	Treatment satisfaction	Satisfied	220(78.6%)	188(85.5%)	32(14.5%)
		Unsatisfied	60(21.4%)	38(63.3%)	22(36.7%)
6	Treatment information	Complete information	160(57.1%)	136(85%)	24(15%)
		Partial information	80(28.6%)	62(77.5%)	18(22.5%)
		Incomplete information	40(14.3%)	28(70%)	12(30%)

Table VI: Therapy-related factors associated with adherence/ nonadherence to ASMs, no 280(100%)

3. vi. Patient-related factors associated with adherence/ nonadherence to ASMs

Knowledge about the disease and treatment had shown to have a strong association with the rate of adherence. The patients/caregivers with poor knowledge about epilepsy and its treatment were more (28.6%) nonadherent as compared to (16.2%) among those who had good knowledge about their disease. Among the study participants; 220(78.6%) were found to have positive attitude towards epilepsy and only 34(15.5%) among them were nonadherent as compared to 60(21.4%) with 20(33.4%) nonadherences among cohort with negative attitude. The association between perceived stigma and non-adherence was significant; caregivers/patients with perceived stigma were more 18(36%) were nonadherent as compared to 36(15.7%) of CWE with no perceived epilepsy stigma. Counseling provided by the treating physicians had good impact upon adherence; caregivers/patients who received poor counseling were 20(50%) nonadherent as compared to 34(14.2%) adherent who got good counseling. Overall belief about medications effectiveness was associated with better adherence to ASMs, but statistically this was not significant. Forgetfulness of administering ASMs was an important factor leading to nonadherence. One hundred and ninety-six of our cohort had no complaint of forgetfulness, but 84(30%) of our cohort had this complaint and 30(35.7%) of them were nonadherent as compared to 24(12.3%) of the patient who did not have this complaint (Table-7).

No	Variables	Category	Frequency (%)	Adherent	Non-adherent
1	Parental knowledge about epilepsy	Good knowledge	200(71.4%)	176 (88%)	24(12%)
		Poor knowledge	80(28.6%)	50(62.5%)	30(37.5%)
2	Patient/Parental attitude towards epilepsy	Positive Attitude	220(78.6%)	186(84.5%)	34(15.5%)
		Negative Attitude	60(21.4%)	40(66.6%)	20(33.4%)
3	Epilepsy stigma	No epilepsy stigma	230(82.1%)	194(84.3%)	36(15.7%)
		Presence of epilepsy stigma	50(17.9%)	32(64%)	18(36%)
4	Counseling for improving adherence	Counseling done	240(85.7%)	206(85.8%)	34(14.2%)
		Counseling not done	40(14.3%)	20(50%)	20(50%)
5	Belief in effectiveness of ASMs	Effective	250(89.3%)	210(84%)	40(16%)
		Ineffective	30(10.7%)	18(60%)	12(40%)
6	Forgetfulness	No forgetfulness	196(70%)	172(87.6%)	24(12.3%)
		Forgetfulness present	84(30%)	54(64.3%)	30(35.7%)

Table V1I: Patient-related factors associated with adherence/ nonadherence to ASMs, no 280(100%)

4. Discussion

4.i. Base line demographic and clinical characteristics of the participants associated with adherence/nonadherence to ASMs among CWE.

Base line demographic and clinical characteristics of our study population are shown in Table-1. Rates of adherence to antiepileptic drugs are variable in different studies ranging between 20-80%. In children however, these rates are even lower estimated between 25 - 75 % [14]. This study found that 226(80.7%) CWE used the recommended antiseizure drugs, however, 19.3% disobeyed. Despite differences in adherence measurement, nonadherence was lower than in other studies [15, 16], but are in agreement with Nazziwa et al. [17]. However, free brain health care facilities are being provided in our charity primary health care facility. Self-reports and parent assessments typically overstate adherence. One study measured serum drug levels and self-adherence. Self-reported adherence accounted for 80% of rates; however, in the same study only 22% of individuals had medication levels that matched their adherence [18].

Age negatively affects medicine adherence [15, 19]. Jacob et al. (20) investigated 5214 epileptic youngsters and found in this study that children under 5 adhered to medicine more than previous research [16,17]. Data volatility may be due to age demographics. Current study indicated that rural residents (23.6%) were more likely to not take ASMs than urban residents (16.5%). Rural cultures may use religious and spiritual therapy due to traditional sickness beliefs. Rural and remote epilepsy services are scarce [21]. Discontinued students were approximately three times more likely to not take ASMs. The authors of this study agree with earlier research [22]. Our sample had 75% moms. Mothers followed instructions 84% of the time. The concerned fathers had 73.3% adherence. Carers other than close relatives reduced adherence to 68%. Our data supports Baca et al. (23), who found that most moms controlled their epilepsy despite minimal understanding.

4.ii Socio-economic& Cost-related factors associated with adherence/nonadherence to ASMs

This research found that 58% of newly diagnosed youngsters who have epilepsy, socioeconomic status influences adherence to antiseizure drugs (ASMs) but in follow-up carers with monthly salaries exceeding 50,000 Pakistani Rupees and those below 10,000 did not differ. 21.4% of the sample bought ASMs with personal money, which had worse adherence than those who got them for free, which is in agreement with other researchers [24, 25]. In impoverished nations with medical shortages, monthly income is strongly correlated with medication nonadherence. The study also indicated that high literacy benefits ASMs adherence, whereas low literacy among parents hurts it.in agreement, ASMs adherence was positively correlated with parental education, although only slightly [26]. Chronic and/or recurring epileptic seizure carers report a heavy load and poor emotional experiences. Carer mental health, financial load, and capacity to manage the kid's sickness all affect child management. Access to the distribution of epilepsy treatment resources in socioeconomically challenged locations can provide significant effects. According to the 2003 WHO study, 40% of people with epilepsy did not take their ASMs. In this study, patients who travelled over 30 kilometers for free neurology services were twice as likely to not follow ASMs.

The study found no statistically significant difference in ASM adherence between parental monthly income, but those who bought ASMs were 2.5 times lower adherent. Socioeconomic status and health literacy status affects 58% of newly diagnosed epilepsy children's adherence are strongly correlated with medication nonadherence in poor nations with drug shortages [24, 25]. The strongest reason for this difference may be free neurology services provided by our centre. This finding supports past research that have found a high frequency of illness among epilepsy carers, including social, emotional, functional, and economic variables [26]. Our findings support previous research, which found that carers who expressed concerns about the economic burden of continuous childhood epilepsy treatment had a higher percentage of nonadherent CWE. The study found a statistically significant positive correlation between a five-person household and medication adherence. This finding matches Iranian (27) and Indian [24], in contrast to other studies family size was not statistically important [28]. Our study supported other similar studies that patients who travelled over 30 kilometers and take more than 2 hours to reach neurology services are more likely to not follow ASMs [22, 28, 29].

4.iii Health care team and system in place associated with adherence/ nonadherence to ASMs

Nonadherence to ASMs is often caused by poor physician-parent communication. According to the index study, those who were unhappy with communication were less likely to follow suggested therapy and reduced treatment adherence fourfold. This supports earlier studies showing that patient adherence to recommended therapies depends on efficient patient-provider communication [30]. Our healthcare staff was urged to aggressively promote (ASM), but no statistically significant impacts were seen. Hovinga et al, [31]. found that patients who trust their doctors stick to their therapy more than those who don't. The study indicated that 34% of patients who trust their doctors take their medicine, compared to 17% of those who dislike them. This shows that physician-patient relationships affect patient adherence. Participants who stuck to their medication schedule felt comfortable addressing missed tablets with their doctor, which may reduce non-adherence. Nonadherence was significantly associated with average or below-average perceived pharmaceutical service availability. Our study demonstrated a favorable link between easy pharmacy access to prescription antiseizure medicines (ASMs) and participant adherence. However, this association was not statistically significant. This study suggests that introducing drugs into daily routines through simple processes might increase chronic disease self-management adherence [32]. Patient and carer participation and counseling can improve antiepileptic medication adherence (33). The BHCF offered CE and treatment counseling to 89.3% of our group, yet 10.7% were dissatisfied. Nonadherence was detected in 46.7% of those who got insufficient or no illness and ASM counseling, compared to 16% of those who received excellent counseling. Our analysis confirms earlier studies that several techniques improve antiseizure drug adherence the greatest. These include epilepsy and antiepileptic medication education and extensive psychotherapy for patients and carers [33, 34]. Patient and carer education about the risks of nonadherence and counseling treatments may improve medication adherence [35].

4 iv. Disease-related factors associated with adherence/nonadherence to ASMs among CWE.

A relative risk of 2.6 was found between children who had seizures in the month before to the interview and their chance of non-adherence to treatment. A study of 298 non-adherent epileptic patients and 110 adherent individuals found a significant connection between non-adherence and insufficient seizure control [31]. India [16], Hawassa University Comprehensive Specialised Hospital [36], Indonesia [37], and Bangladesh [38] had comparable results. Repeated seizures reduce the certainty of detecting and treating the illness, which may lead to pharmaceutical resistance. Previous investigations [39] reported that seizure type, frequency, or adverse events have differences between adherence trajectory in different cohorts. The difference of seizure control judgment between parents and medical experts was statistically negligible in our research; this is in agreement with other studies [40]. Our patients had a significant frequency of generalised epilepsy (71.4%; Table 4). Children with generalised seizures, unclassified seizures, and partial seizures adhered 85%, 72%, and 66.7%, respectively. Shah et al. [19] found that generalised and partial epilepsy patients adhered to their medications differently. Generalised epilepsy patients had higher adherence than febrile, rolandic, or myoclonic seizure patients, according to Al-Faris et al, [39]. Our analysis found no significant difference in epilepsy duration between high and poor AED adherence groups, which is consistent with Gabr and Shams' Saudi Arabian study [40]. Our analysis differs with Liu et al. [41], a Chinese study that found worse adherence among patients with longer treatment durations. Dima et al, found

that children with epilepsy for 1-2 years were 4.58 times more likely to follow their therapy than those with epilepsy for more than 3 years [28].

4 v. Therapy-related factors associated with adherence to ASMs

Phenobarbital, Phenytoin, Carbamazepine, and sodium Valproate are widely available in numerous countries, and over 70% of patients respond to at least one AED [42]. Our study found that 60.7% of CWE single ASM, whereas 39.3% received ≥1 ASMs. The findings agree with Gurumurthy et al. (43), who found that 53.4% of epileptic patients received monotherapy and 46.6% polytherapy. This study revealed lower rates than Al Ajmi et al. [44] and similar rates to earlier publications [45]. In our investigation (Tale V), Carbamazepine (30.76%) and valproate (23%) were the most commonly administered monotherapy. Carbamazepine with Valproate was the most common polytherapy (29.4%). The relationship between medication amount and therapy adherence has been inconsistently studied. Carbone et al. (46) found a favorable connection between drug adherence and prescription mounts. In contrast, Gabr and Shams et al. [40] found a contradiction. Polytherapy participants had a 29% nonadherence rate compared to 13% for monotherapy individuals in the research. Negative association between treatment complexity and adherence has been well documented. Patients who got three daily doses of antiseizure drugs (ASMs) were three times more likely to be nonadherent (29.3%) than those who received one daily dosage (10%). The relationship between treatment complexity and patient adherence is well documented [40, 47]. Treatment complexity affects both newly diagnosed and long-term patients [68, 69]. Numerous studies have shown that a lower daily dose frequency improves adherence [70, 71]. Patients' understanding of therapy decreases with complexity, resulting in non-adherence to pharmacological prescriptions [48]. The intricacy of therapy might hinder symptom management. Non-adherence is 13.68 times higher among those who encounter negative outcomes. Malaysian research supports these findings [49]. This may be due to healthcare providers not providing enough counseling and health education about pharmaceutical adverse effects. Lack of understanding about antiepileptic medication (AED) side effects may lead patients to stop using them immediately after an unpleasant incident.

4. vi. Patient-related factors associated with adherence/ nonadherence to ASMs

The present study found that 60.7% of patients were willing to take their medicine, which is consistent with a Saudi Arabian study [39, 40]. Patient and carer adherence to antiseizure drugs (ASMs) was strongly correlated with their confidence in their effectiveness. In our sample, 50% of nonbelievers in ASM efficacy were nonadherent, compared to 28.6% of partial efficacy and 14.1% of complete efficacy (Table 6). Many studies have shown that medicine beliefs predict medication adherence [50]. Accordingly, our study demonstrated a strong correlation between pharmaceutical beliefs and treatment adherence. This study confirmed prior studies (51) showing patients who had poor views on the necessity of their antiepileptic medicines (AEDs), major worries about their prescriptions, and unfavorable opinions about their medications were more likely not to abide. More efforts are needed to improve patients' knowledge of their medication's importance and improve adherence. Effective counseling and communication between healthcare providers and epilepsy parents are essential. This communication should discuss the condition's cause, symptoms, treatments, the benefits of antiepileptic drugs (AEDs), dosage changes, potential drug interactions, side effects, and the need to follow the treatment [52]. Carers/Epileptic children and adolescents must be satisfied with their therapy. Our research found that patients who were pleased with their treatment had a 14.5% nonadherence rate, compared to 36.7% for those who were dissatisfied (Table 6). The satisfied children and adolescents who had their seizures treated may have achieved this outcome because they adhered to their antiseizure drugs. Conversely, nonadherent ASM users may have had more seizures.

4.V11. Patient variables affecting ASM adherence or nonadherence

A large proportion (71.4%) of survey participants knew enough about epilepsy. This group also had a 12% nonadherence rate to antiseizure drugs (ASMs). From the data shown in Table VII, it can be observed that parents who possessed a lower level of awareness on childhood epilepsy exhibited a nonadherence rate that was three times higher. Our findings are consistent with a Turkish study of 226 children with chronic wet eczema (CWE) and their primary carers [83]. Our study showed much higher adherence than the Indian study [54]. The survey found that 220 individuals (78.6%) were positive about their children's epilepsy. Conversely, 21.4% of 60 people had negative attitude. Positive attitudes regarding epilepsy and adherence to antiseizure drugs were significantly correlated. 33.4% of negative attitude participants were nonadherent to ASMs, compared to 15.5% of good attitude participants. We found results that match prior studies in disadvantaged nations (55). Poor treatment adherence and negative attitudes towards therapy are major obstacles when treating brain illnesses in rural and economically disadvantaged people and children. The attitudes of parents and carers affect how children manage epilepsy medication [56]. Health education for patients and their families improves medication compliance. Multiple factors affected patients' adherence views. Patients' lack of understanding of therapy's importance, their apprehension of prolonged drug use, their limited understanding of the disease and the potential consequences of non-adherence (A), and their tendency to discontinue medicine on the assumption that it may no longer be necessary are all caused by several factors. Epileptic children face social stigma, which prevents them from seeking medical care. Epileptic patients who felt stigma were 2.3 times more likely to not adhere, according to our study. Our data supports previous research that suggests antiseizure medication might remind individuals of epilepsy stigma and CWE may avoid taking their medicine in public [57, 58]. The provision of a comprehensive counseling session by healthcare professionals for individuals with epilepsy and their carers has been shown to improve carers' understanding of epilepsy and AEDs and their confidence in caring for children with epilepsy. Based on their ideas about ASM efficacy, our group adhered to them differently. In particular, 21.1% of the cohort disobeyed when they believed in ASM achievement. When ambivalent towards ASMs, 24% of the cohort did not comply. Most research participants (70%) did not experience forgetfulness when giving their children ASMs. However, 30% of the cohort that had forgetfulness issues had problems. This group had 35.7% nonadherent CWE, compared to 12.3% for caretakers who did not experience forgetfulness (Table VII). In another study, 52.2% of parents were forgetful about giving their children medications, and 33.5% worried about drug adverse effects. Non-adherence to treatment regimens was substantially connected with these characteristics. The findings of our study are supported by global academic research [59, 60]. This study suggests that this barrier has significant negative effects across all age groups. This study found that people with chronic and complicated neurological diseases didn't always use antiseizure drugs. This was true even if disadvantaged, hard-to-reach communities had free brain health care. The study found that ASM barriers persisted for eleven years without treatment. Further research is needed to determine if obstacles and facilitators exist across all pediatrics age groups. Since different barriers to adherence affect different clinical outcomes, ongoing examination of adherence barriers is crucial from early infancy through emerging adulthood. Complementary brain health care services at the community level may improve treatment adherence and prioritize individuals at risk of poor outcomes throughout certain developmental phases.

Limitations

Due to recall bias and the use of clinical evidence for diagnosing and commencing ASMs for many CWE without EEGs, the results of a research conducted at a single free brain health care facility may not be generalizable to regional or national levels. In economically disadvantaged and geographically remote places, it may not be possible to provide a full range of pediatrics neurology treatments.

Recommendations

Public, commercial, and charitable health sectors could work with local and national vendors to give free ASMs and brain health treatment to all patients in financially disadvantaged areas, including Pakistan's outreach financially

constrained areas. Local doctors should regularly check CWE for side effects and treat it with the safest medicine. Patient, family, and community health education in the local language may enhance medication and follow-up adherence. Finally, carers must urge patient adherence to ASMs.

Conclusions

Comprehensive epilepsy care for children requires understanding their condition, comorbidities, family, strengths, and weaknesses. 19.3% of CWE were non-adherent due to rural areas lacking infrastructure or neurology clinics. Healthcare practitioners should regularly assess ASM nonadherence and implement interventions to improve patients' beliefs, seizure control, and access to antiepileptic medicines. The study's findings may be limited due to recall bias and the use of clinical evidence.

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