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EDITORIAL

Time to treat the climate and nature crisis as one indivisible global health emergency.

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[1]British Medical Journal; [2]International Nursing Review; [3]*Medical Journal of Australia*; [4]*Danish Medical Journal*; [5]Journal of the American Medical Association; [6]*British Dental Journal*; [7]*The Lancet*; [8]University of Exeter; [9]*African Journal of Primary Health Care & Family Medicine*; [10]*National Medical Journal of India*; [11]*Dubai Medical Journal*; [12], *East African Medical Journal*; [13]*West African Journal of Medicine*, [14]University of Winchester.

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Over 200 health journals call on the United Nations, political leaders, and health professionals to recognise that climate change and biodiversity loss are one indivisible crisis and must be tackled together to preserve health and avoid catastrophe. This overall environmental crisis is now so severe as to be a global health emergency.

The world is currently responding to the climate crisis and the nature crisis as if they were separate challenges. This is a dangerous mistake. The 28th Conference of the Parties (COP) on climate change is about to be held in Dubai while the 16th COP on biodiversity is due to be held in Turkey in 2024. The research communities that provide the evidence for the two COPs are unfortunately largely separate, but they were brought together for a workshop in 2020 when they concluded that: “Only by considering climate and biodiversity as parts of the same complex problem…can solutions be developed that avoid maladaptation and maximize the beneficial outcomes”[1].

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As the health world has recognized with the development of the concept of planetary health, the natural world is made up of one overall interdependent system. Damage to one subsystem can create feedback that damages another—for example, drought, wildfires, floods and the other effects of rising global temperatures destroy plant life, and lead to soil erosion and so inhibit carbon storage, which means more global warming [2]. Climate change is set to overtake deforestation and other land-use change as the primary driver of nature loss [3].

Nature has a remarkable power to restore. For example, deforested land can revert to forest through natural regeneration, and marine phytoplankton, which act as natural carbon stores, turn over one billion tonnes of photosynthesising biomass every eight days [4]. Indigenous land and sea management has a particularly important role to play in regeneration and continuing care [5].

Restoring one subsystem can help another—for example, replenishing soil could help remove greenhouse gases from the atmosphere on a vast scale [6]. But actions that may benefit one subsystem can harm another—for example, planting forests with one type of tree can remove carbon dioxide from the air but can damage the biodiversity that is fundamental to healthy ecosystems [7].

The impacts on health

Human health is damaged directly by both the climate crisis, as the journals have described in previous editorials, [8,9]. and by the nature crisis [10]. This indivisible planetary crisis will have major effects on health as a result of the disruption of social and economic systems—shortages of land, shelter, food, and water, exacerbating poverty, which in turn will lead to mass migration and conflict. Rising temperatures, extreme weather events, air pollution, and the spread of infectious diseases are some of the major health threats exacerbated by climate change [11]. “Without nature, we have nothing,” was UN Secretary-General António Guterres’s blunt summary at the biodiversity COP in Montreal last year [12]. Even if we could keep global warming below an increase of 1.5◦C over pre-industrial levels, we could still cause catastrophic harm to health by destroying nature .

Access to clean water is fundamental to human health, and yet pollution has damaged water quality, causing a rise in water-borne diseases [13]. Contamination of water on land can also have have far-reaching effects on distant ecosystems when that water runs off into the ocean [14]. Good nutrition is underpinned by diversity in the variety of foods , but there has been a striking loss of genetic diversity in the food system. Globally, about a fifth of people rely on wild species for food and their livelihoods [15].

Declines in wildlife are a major challenge for these populations, particularly in low- and middle-income countries. Fish provide more than half of dietary protein in many African, South Asian and small island nations, but ocean acidification has reduced the quality and quantity of seafood [16].

Changes in land use have forced tens of thousands of species into closer contact, increasing the exchange of pathogens and the emergence of new diseases and pandemics [17]. People losing contact with the natural environment and the declining biodiversity have both been linked to increases in noncommunicable, autoimmune, and inflammatory diseases and metabolic, allergic and neuropsychiatric disorders [10,18]. For Indigenous people, caring for and connecting with nature is especially important for their health [19]. Nature has also been an important source of medicines, and thus reduced diversity also constrains the discovery of new medicines.

Communities are healthier if they have access to high-quality green spaces that help filter air pollution, reduce air and ground temperatures, and provide opportunities for physical activity [20]. Connection with nature reduces stress, loneliness and depression while promoting social interaction [21]. These benefits are threatened by the continuing rise in urbanisation [22].

Finally, the health impacts of climate change and biodiversity loss will be experienced unequally between and within countries, with the most vulnerable communities often bearing the highest burden. [10] Linked to this, inequality is also arguably fuelling these environmental crises. Environmental challenges and social/health inequities are challenges that share drivers and there are potential co-benefits of addressing them [10].

A global health emergency

In December 2022 the biodiversity COP agreed on the effective conservation and management of at least 30% percent of the world's land, coastal areas, and oceans by 2030 [23]. Industrialised countries agreed to mobilise $30 billion per year to support developing nations to do so [23]. These agreements echo promises made at climate COPs.

Yet many commitments made at COPs have not been met. This has allowed ecosystems to be pushed further to the brink, greatly increasing the risk of arriving at 'tipping points', abrupt breakdowns in the functioning of nature [2,24]. If these events were to occur, the impacts on health would be globally catastrophic.

This risk, combined with the severe impacts on health already occurring, means that the World Health Organization should declare the indivisible climate and nature crisis as a global health emergency. The three pre-conditions for WHO to declare a situation to be a Public Health Emergency of International Concern [25] are that it: 1) is serious, sudden, unusual or unexpected;

2) carries implications for public health beyond the affected State's national border; and 3) may require immediate international action. Climate change would appear to fulfil all of those conditions. While the accelerating climate change and loss of biodiversity are not sudden or unexpected, they are certainly serious and unusual. Hence we call for WHO to make this declaration before or at the Seventy-seventh World Health Assembly in May 2024.

Tackling this emergency requires the COP processes to be harmonised. As a first step, the respective conventions must push for better integration of national climate plans with biodiversity equivalents [3]. As the 2020 workshop that brought climate and nature scientists together concluded, "Critical leverage points include exploring alternative visions of good quality of life, rethinking consumption and waste, shifting values related to the human-nature relationship, reducing inequalities, and promoting education and learning" [1]. All of these would benefit health.

Health professionals must be powerful advocates for both restoring biodiversity and tackling climate change for the good of health. Political leaders must recognise both the severe threats to health from the planetary crisis as well as the benefits that can flow to health from tackling the crisis [26]. But first, we must recognise this crisis for what it is: a global health emergency.

Authors' contributions

Laurie Laybourn-Langton developed the idea of the editorial and led drafting along with Chris Zielinski. All other authors contributed significantly to the editorial content.

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ORIGINAL ARTICLE

QUALITY OF COMPASSIONATE CARE AMONG CHILDREN WITH CHRONIC HEART FAILURE AT TIKUR ANBESSA SPECIALIZED HOSPITAL: A CROSS-SECTIONAL ANALYSIS

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ABSTRACT

***Background**: Compassion is a deep awareness of the suffering of another coupled with the wish to relieve it. Heart failure/HF is a progressive clinical and pathophysiological condition caused by cardiovascular and noncardiovascular abnormalities. The study aimed to assess compassionate care among children with chronic HF at Tikur Anbessa Specialized Hospital.*

***Methods**: This observational cross-sectional study employed an Amharic 12-item Schwartz Center Compassionate Scale (SCCS) to assess compassionate care. Children aged 7years and above were included in the study. Logistic regression models were used to assess predictors.*

***Results**: The study included 155 chronic HF subjects, females 56.1% (87). Majority of the respondents,75.5% (117), lived in an urban setting within 100-kilometers from health facility, 58.7% (91). The mean age at diagnosis and duration of follow-up was 5.2±3.8years and 5±3.5years, respectively. Congenital heart diseases, 55.5% (86) and rheumatic heart disease, 36.1% (56) were common causes for chronic HF. Successful compassionate care was reported in 25.2% (39) (95% CI: 18.5-32.8) of study subjects. Study subjects who lived within 100-kilometers from the follow up health facility had two times higher odds of reporting successful compassionate care, [AOR: 2.24, 95% CI: 1.06-4.75, P 0.035)]*

***Conclusion**: In this study, only one fourth of study subjects with chronic heart failure had received compassionate care. Distance from the follow up health facility predicted successful compassionate care. Modalities to improve access including decentralization of clinical services for children with chronic heart failure and further mixed studies are recommended to assess how distance from a health facility relate to compassionate care.*

Keywords: compassion, compassionate care, Children, heart failure, chronic heart failure, Ethiopia

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Background

Compassion is a deep awareness of the suffering of another coupled with the wish to relieve it (1). The World Health Organization (WHO) has put it as a measure of a patient-centered quality of health care services (2). Ethiopia took compassion and compassionate care as a pillar of quality of health care services in the aim of achieving universal health coverage (3-5). Compassionate care has been shown to reduce patient anxiety, improve patient-physician communication, increase patient sense of responsibility/adherence, and patient trust on health professionals (6-10).

Lack of pre-service training on compassionate care for health professionals; lack of time, support and resource in the health system; clinician burnout, high case load; and patient factors like age were documented as barriers for compassionate care (9). Assessment of compassionate care in the health care has been challenged by the difference in culture, religion, health care setting and competency of the health professionals (11). Patient compassionate care assessment tool was developed to assess compassionate care among cancer patients with advanced disease and palliative care recipients (12, 13). Nursing care compassionate care assessment tool in acute care was developed as another compassionate care assessment tool (14). The 12-item Schwartz Center Compassionate Scale (SCCS) was developed to measure patient assessment of a care provided by physicians (11). SCCCS tool is considered a reliable and valid measure of patients' perceptions of compassionate health care of physicians and the healthcare team. The items were developed by a group of people from patients, family members, policy-makers, and advocators and finally adapted through a focus group discussion with patients, physicians, and nurses. Patients complete the items of the tool using a ten-point scale from 1 (not at all successful) to 10 (very successful) (11,15). Amharic version was prepared and validated for clinical use in Ethiopia (16).

Heart failure/HF is a progressive clinical and pathophysiological condition caused by cardiovascular and noncardiovascular abnormalities. It usually culminates with cardiac dilation, thinning of walls and dysfunctional contractility (17). Common causes of HF in children include structural heart diseases and infectious diseases (18,19). Ethiopian studies documented structural heart diseases, congenital heart disease or rheumatic heart disease, as a common cause of childhood HF (20,21). Severity of HF is graded clinically into four based on modified Ross or New York Health Association (NYHA) Classification with class I and IV representing mild and severe symptoms, respectively (22, 23). HF management includes correction of the underlying cause and precipitant factors (24). As opposed to western settings, patients in sub-Saharan Africa depend on mission-based volunteerism and correction of an underlying cause for HF is

not readily available (25). To the best of our knowledge, there are no studies that assessed compassionate care among children with chronic heart failure. This study aimed at assessing compassionate care among children with chronic heart failure and limited access to definitive care in a national tertiary cardiac referral hospital for Ethiopia.

Methods

Study Setting

The study was conducted in Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia. It is the teaching hospital of Addis Ababa University, College of Health Sciences, and School of Medicine. It is also the national referral hospital in Ethiopia with multiple specialties and sub-specialties. Pediatric cardiac clinic provides follow up for outpatient care of pediatric patients with congenital and acquired cardiac problems. It gives service on all of the five working days. The clinic is attended by consultant pediatric cardiologists, pediatric cardiology fellows, pediatric residents and trained nurses. Based on the clinic registry, there were 258 children between the ages of 7 and 18 years with chronic heart failure enrolled in the follow up.

Study population

All children aged 7years and above with chronic heart failure and attending follow up at the pediatric cardiology clinic during the study period.

Study Design and Study Period

The study used cross-sectional study design during the periods of March and September 2022.

Sample size and sampling procedure

A sample size of 155 was calculated with correction formula for finite population using EPI info version 7 statistical packages for sample size and power calculation taking an assumption of successful compassionate care among HF patients as 50%, 95% confidence level with 5% margin of error and a power of 80%. Proportion of 50% was used due to lack of previous local or international study on compassionate care among children with HF.

Inclusion and Exclusion Criteria

All children aged 7 years and above with NYHA II and above functional status with established echocardiographic diagnosis and enrolled in chronic care for over 6months were included. Study subjects with developmental issues like cerebral palsy and Down syndrome were excluded as these limit their ability to self-report compassionate care.

Data collection

Demographic and clinical data were collected using structured questionnaire which was pretested in non-participating patients. Compassionate care was assessed using an Amharic validated 12-item Schwartz Center Compassionate Scale (SCCS), the only validated tool in Ethiopia. SCCCS tool is considered a reliable and valid measure of patients' perceptions of compassionate health care of physicians and the healthcare team. The items were developed by a group of people from patients,

family members, policymakers, and advocators and finally adapted through a focus group discussion with patients, physicians, and nurses. Patients complete the items of the tool using a ten-point scale from 1 (not at all successful) to 10 (very successful) (11, 15). It was tested and used in many parts of the world, and an Amharic version was prepared and validated for clinical use in Ethiopia (16). Clinical and sociodemographic data were collected using pretested questionnaire by BSc Nurses, and one-day training was given by the investigators. The quality of daily collected data was checked by investigators.

Variables

The dependent variable was compassionate care assessment scale. Age, sex, place of residence, educational status, family size, age at diagnosis of cardiac disease, type of heart disease, frequency of follow up, duration of follow up, pill burden, NYHA status, distance from the follow up health facility, health cost coverage and any surgery/intervention for cardiac illness were independent variables.

Operational definitions

NYHA functional status was a functional classification of study subjects according to cardiac functional capacity using the New York Health Association at the time of data collection (23). Chronic heart failure was considered by the presence of class II and above NYHA symptoms that lasted for over six months. Compassionate care was a deep awareness of the suffering of another coupled with the wish to relieve it (1). Successful compassionate care was considered when a total score of 10 was obtained on SCCSS scale while unsuccessful for the rest of the summation points. Compassionate care assessment scale is a score that a study subject puts in 1-10 rated scale about how the health care providers were treating him or her as assessed by the 12-item Schwartz Center Compassionate Scale (SCCSS) (15).

Data analysis

After checking for data completeness analysis was done using statistical software for social sciences 25. Univariate association with dependent variable was assessed using chi-square test. Variables with p value less than 0.05 were selected for final multivariable logistic regression model to ascertain association. Previously studied variables (age, sex, education, and frequency of follow up) in relation to patient self-report of compassionate were also included in the final model (26, 27). P value less than 0.05 was taken as statistically significant and association was reported using odds ratio with its 95% confidence interval.

Results

Sociodemographic characteristics and compassionate care among children with chronic heart failure

A total of 165 patients were approached and ten were excluded (one had cerebral palsy while 9 had clinical evidence of Down syndrome). Finally, 155 study subjects, between

the ages of 7 and 18years, were included in the study. The mean age of study subjects was 11.4±2.6years. Females dominated the study population, 56.1% (87). Almost half of study subjects resided in the study area, 48.4% (75). Majority of the study subjects came from an urban setting, 75.5% (117). About sixty percent, 58.7% (91), lived within 100-kilometers from the follow up health facility. The most distant residing subject came from 800-kilometers.

Concerning education, majority were enrolled in primary education, 92.9% (144). Majority lived in a family size of ≤5, 58.1% (90). Concerning health related costs, 58.1% (90), were medically insured. (See Table 1).

Table 1. Sociodemographic profile of children with chronic heart failure having follow-up at Tikur Anbessa Specialized Hospital, 2022

Variable	**Category**	**Number**	**Percentage (%)**
Age (in years)	7-10.9	68	43.9
	11-18	87	56.1
Gender	Male	68	43.9
	Female	87	56.1
Place of residence	Urban	117	75.5
	Rural	38	24.5
Distance from follow up health facility (kilometers)	≤100	91	58.7
	>100	64	41.3
Educational level	Primary school	144	92.9
	Secondary school	11	7.1
Family size	≤5	90	58.1
	>5	65	41.9
How is your health cost covered?	Out of pocket payment	65	41.9
	Medically insured	90	58.1

There was no difference between boys and girls in terms of report of successful compassionate care. Moreover, no association was documented between successful compassionate care and sociodemographic variables (age, place of residence, educational status, family size, and access to health insurance). However, distance from the follow-up health facility showed association with successful compassionate care. (See Table 2)

Table 2. Univariate analysis outputs of variables about successful compassionate care provided for pediatric chronic heart failure patients at Tikur Anbessa Hospital, 2022

Variable	**Category**	**Successful compassionate care**		**COR (95% CI) P value**
		Yes	No	
Age (in years)	7-10.9	15	53	0.74(0.35-1.56), 0.43
	11-18	24	63	1
Sex	Male	18	50	1.13(0.55-2.35), 0.74
	Female	21	66	1
Residence	Urban	25	92	0.47(0.21-1.03), 0.06
	Rural	14	24	1
Family size	≤5	18	72	0.52(0.25-1.09), 0.08
	>5	21	44	1
Age at diagnosis (years)	≤5	18	68	0.61(0.29-1.26), 0.18
	>5	21	48	1
Duration of follow up	≤5	21	66	0.88(0.43-1.83), 0.74
	>5	18	50	1
Type of heart disease	Congenital heart disease	18	68	0.61(0.29-1.26), 0.18
	Rheumatic heart disease or others	21	48	1
How is your health cost covered?	Out of pocket payment	15	50	0.83(0.39-1.73), 0.61
	Medically insured	24	66	1
Frequency of follow up	Monthly/every two month	16	43	1.18(0.56-2.48), 0.66
	Every three/six month	23	73	1
Cardiac oral medications/ pill burden	Multiple	27	75	1.23(0.56-2.68), 0.60
	Single or none	12	41	1
NYHA functional class	II	17	66	0.59(0.28-1.22), 0.15
	III or IV	22	50	1
Distance from health facility (kilometers)	≤100	17	74	0.44(0.21-0.92),0.03*
	>100	22	42	1
Education status	Primary	37	107	1.56(0.32-7.53), 0.58
	High school	2	9	1
Any surgery or intervention?	Yes	2	18	0.29(0.07-1.33), 0.11
	No	37	98	1

Clinical characteristics and compassionate care among children with chronic heart failure

More than half of the study subjects had congenital heart disease as a cause for chronic heart failure, 55.5% (86); rheumatic heart disease contributed to 36.1% (56) of study subjects. From congenital heart disease, acyanotic form predominated 36.1% (56). The mean age at diagnosis of an underlying cardiac disease was 5.2±3.8yrs. Majority of study subjects were on every three months follow up visit schedule, 51.6% (87). The mean duration of follow up was 5±3.5yrs.

Concerning associated comorbidity, only 7.1% (11) had associated comorbidity. All rheumatic heart disease subjects, 36.1 % (56), were on benzathine penicillin secondary prophylaxis. Majority of the study subjects were on multiple cardiac oral medications, 65.8% (102), at the time of study. A little over one tenth of the subjects, 12.9% (20), had surgery or intervention for their underlying cardiac illness. Successful compassionate care was reported by 25.2 % (39) (95% CI: 18.5-32.8) of study subjects. (See Table 3)

Table 3. Clinical characteristics and compassionate care among children with chronic heart failure at Tikur Anbessa Specialized Hospital, 2022

Variable	Category	Number	Percentage (%)
Underlying heart disease	Congenital heart disease	86	55.5
	Rheumatic heart disease	56	36.1
	Dilated cardiomyopathy	3	1.9
	Others	10	6.5
Age at diagnosis of underlying cardiac illness (in yrs)	≤1	36	23.2
	1-5	38	24.5
	≥5	81	52.3
Frequency of follow up	Monthly	20	12.9
	Every two month	39	25.2
	Every three month	80	51.6
	Every six month	16	10.3
How long have you been in the follow up? (years)	≤5	87	56.1
	>5	68	43.9
NYHA functional class status	II	83	53.5
	III	68	43.9
	IV	4	2.6
Cardiac oral medications/ pill burden	Single	12	7.7
	Multiple	102	65.8
	None	41	26.5
Any surgery or intervention for underlying heart condition?	Yes	20	12.9
	No	135	87.1
Successful compassionate care	No	116	74.8
	Yes	39	25.2

No association was documented between successful compassionate care and duration of follow up, frequency of follow up, type of heart disease, pill burden, NYHA class, any surgery or intervention for underlying heart disease (See Table 2)

Factors associated with successful compassionate care among children with chronic heart failure

Study subjects who lived within 100-kilometers from the follow up health facility had two times higher odds of reporting successful compassionate care, aOR 2.24(95% CI: 1.06-4.75, P 0.035). Age, sex, educational status and frequency of follow up didn't show any association with successful compassionate care. (See Table 4)

Table 4. Factors associated with successful compassionate care among children with chronic heart failure at TASH, 2022

Variable	Category	Compassionate care		COR (95% CI), P value	AOR (95% CI), P value
		Yes	No		
Age (in years)	7-10.9	15	53	0.74(0.35-1.56), 0.43	1.37(0.63-2.99), 0.429
	11-18	24	63	1	1
Sex	Male	18	50	1.13(0.55-2.35), 0.74	0.89(0.42-1.89), 0.768
	Female	21	66	1	1
Education status	Primary	37	107	1.56(0.32-7.53), 0.58	0.49(0.09-2.54), 0.400
	High school	2	9	1	1
Distance from health facility (kilometers)	≤100	17	74	0.44(0.21-0.92), 0.03	2.24(1.06-4.75),0.035*
	>100	22	42	1	1
Frequency of follow up	Monthly/ every two month	16	43	1.18(0.56-2.48), 0.66	0.88(0.41-1.91), 0.749
	Every three/ six month	23	73	1	1

Discussion

In this study, only one fourth of children with chronic heart failure received compassionate care. Majority resided in an urban setting within 100-kilometers from the follow up health facility. Distance from the health facility predicted successful compassionate care.

In the current study, majority came from an urban setting. This is in agreement with previous Ethiopian studies (28, 29). This could be related to improved awareness and health care seeking behavior among urban dwellers compared to rural residents (30). However, this is as opposed to the higher odds of congenital (31) and rheumatic heart diseases (32) among rural residents. While much is to be studied in a larger scale, a poor chronic follow up attendance of a rural child with heart disease could also signal centralization of the care provision leaving them vulnerable.

In our study, chronic care recipients lived within 100-kilometers from the follow up health facility. This is in agreement with another study (29). While this may be considered as a proxy for service accessibility it must be interpreted in light of the challenge that a child

with chronic heart failure will have to travel long distance for a follow up. Costs related to transportation were also pointed out as a challenge for the child coming from far (33).

No association was documented between age and successful compassionate care in this study. This is in agreement with Ethiopian studies that documented similar finding among older study subjects (26, 27). However, an Egyptian study documented more vigilance of elderly patients on compassionate care provision (34). Comparison of our finding could not be made to similar report due to unavailability of published data among children with cardiac illnesses. Similarly, no association was documented between gender and successful compassionate care in our study. This is similar to another Ethiopian study (27). In our study, education status was not associated with the patient self-report of compassionate care. This is as opposed to another study where educated patients reported low compassionate care from the healthcare providers (26). The noted difference might be due to the difference in the age of study subjects where the later included adults. We report no association between frequency of health visits and compassionate care. However, patients who had three and more health visits had poor compassionate care in another study (26).

Distance from the health facility predicted compassionate in our study. Those who resided within 100-kilometers reported successful compassionate care. Distance from a health facility was reported as a barrier to child health visits in another study (35). This could be related to indirect health related costs like transportation and foods. Qualitative studies are recommended to assess the details of barriers and facilitators. Modalities of decentralization of pediatric cardiac follow up services should be considered to improve the patient's satisfaction.

The strength of our study included use of an Amharic compassionate care assessment tool that is approved for use among patients with chronic illness, collection of sociodemographic and clinical variables on prospective basis. However, our study is not without limitation. First, it is a single center study. Second, we didn't include qualitative assessment. Thirdly, we have employed an Amharic tool that was validated among older subjects and that might have an effect in younger subjects. However, our study reports the level of compassionate care and its predictor among school enrolled children in their second decade of life with chronic heart failure. This study helps policy makers to design modalities to decentralize clinical chronic heart failure management services among children including timely attention to access to definitive treatment or interventions. Further multicenter mixed studies will help in formulating and designing health care policy for children with chronic heart failure.

Conclusion

In this study, only one fourth of study subjects with chronic heart failure had received successful compassionate care. Children in the

second decade of life living in an urban setting with structural heart disease (CHD and RHD) dominated. Distance from the follow up health facility predicted report of successful compassionate care. Decentralization of clinical services for children with chronic heart failure and further mixed studies are recommended to assess how distance relate to compassionate care are recommended.

Declarations

Ethical Approval

Ethical clearance was obtained from the Research Ethics Committee, Department of Pediatrics and Child Health, School of Medicine, College of Health Sciences, Addis Ababa University on 16/3/2022 with minute number of DRPC/006/14. Informed written consents from parents of children was obtained. A verbal assent was secured from children between the ages of 12 and 18. Confidentiality of collected data was ensured.

Availability of data

The datasets analyzed during this study are available from the corresponding author on reasonable request.

Authors contribution

HT conceived the idea, wrote the proposal, prepared data collection tool, supervised data collection, analyzed the data, and wrote the manuscript. TM commented on different versions of the proposal and data collection tool, and manuscript.

Competing interests

The authors declare no conflict interests related to this manuscript.

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ORIGINAL ARTICLE

KNOWLEDGE AND PRACTICES ON DIABETIC CARE AMONG THE CAREGIVERS OF CHILDREN WITH TYPE 1 DIABETES MELLITUS: A CROSS SECTIONAL STUDY

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ABSTRACT

***Background**: Diabetes mellitus care in children requires parental support and involvement as young children cannot independently handle all of their diabetes cares; the diabetic cares given to these children entirely depend on the knowledge and skills of the care givers. This study was conducted to determine the knowledge and practices on diabetic care and associated factors among the caregivers of children with type 1 diabetes mellitus attending the follow-up clinic at Jimma Medical Center, Southwest Ethiopia.*

***Methods**: Institution-based prospective cross-sectional study was conducted from July 10 to October 10, 2022. Data was collected using a structured questionnaire and analyzed using statistical packages for social sciences software Version 25.0. Bivariate and stepwise multivariate analysis was performed to test associations between the dependent and independent variables.*

***Results**: One hundred fifty-eight caregivers of children with type 1 diabetes mellitus participated in the study; over half of the participants (93, 58.9%) were females. Over half of caregivers have a poor level of knowledge (56.3%) and practice (58.6%) about diabetes cares. Participants residing in the urban area are found to have better knowledge (p<0.001; 95%CI:1.81-6.86), whereas being female caregiver (p=0.03; 95%CI:1.04-4.22), attending diabetic education sessions (p=0.035; 95%CI:1.17-79.66) and, those who had good diabetes knowledge (p=0.04; 95% CI:1.03-4.04) were found to have a better practice.*

***Conclusion**: The knowledge and practices of caregivers regarding diabetic care among caregivers of children with type 1 diabetes mellitus were found to be low. Structured diabetes care education should be given to all caregivers to improve their knowledge and practices.*

Keywords: Type 1 diabetes; caregivers; knowledge; practice

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INTRODUCTION

The primary management strategy for a child with type 1 diabetes mellitus (DM) aims to achieve optimal glycemic control to reduce the risk of long-term complications of DM while preventing acute complications and maintaining the highest possible quality of life(1). The key factor to achieving good glycemic levels is the person's daily self-management of his/her condition. The key self-management activities specific to diabetes care in individuals living with diabetes are regular physical activities, appropriate dietary practices, daily foot care practice, compliance with the treatment regimen, sick day guidelines and recognition, treatment, and prevention of diabetes complications like hypoglycemia and diabetic ketoacidosis (DKA)(1–4).

However, most of these self-care activities are too challenging for young children to complete on their own. Therefore, it is the responsibility of their caregivers/parents to provide diabetes care to children with type 1 DM. Thus, education about diabetes care practice for a child and adolescent with diabetes must be provided to the entire family. Emphasis should also be given to integrate age and developmentally-appropriate self-care into the child's diabetes management (1).

Several studies have shown that caregivers' knowledge and practice of diabetes care have a direct effect on the glycemic level of children and the occurrence of both acute and chronic complications of diabetes(5–8). Despite this fact, recent studies conducted in low and middle -income countries indicate that many caregivers lack the necessary knowledge and practice regarding various aspects of diabetes care, which could have an adverse effect on their children's overall diabetes control and associated complications(9–11).

Hence, this study was conducted with the objectives of determining the knowledge and practices of parents/caregivers of children with type 1 DM regarding diabetic care and associated factors. This will be helpful in designing subsequent interventions to improve the diabetic care for children with type 1 DM.

Methods and materials

Study Area and Period: The study was conducted at the chronic follow-up clinic of Jimma Medical Center, a tertiary hospital, Southwest Ethiopia from July 10 to October 10, 2022. There were a total of 173 children and adolescents with type 1 diabetes mellitus on regular visits at the pediatric follow-up clinic of Jimma Medical Center out of which 5 were on follow up only for less than 3 months; 158 of them were included in the study.

Study design: Institution-based cross-sectional study design with prospective data collection was employed.

Sample size and sampling technique: To calculate the sample size, we used single population proportion formula with the assumption of 95% level of confidence, 5% marginal error, 5% non-response rate and taking proportion of caregiver knowledge level of 45% from previous studies done in Addis Ababa (12). Since the source population consisted of less than 10,000 respondents, the sample size

was adjusted by using correction formula. This revealed a final sample size of 122. However, as the sample size was manageable and also to improve the precision, we decided to include all participants fulfilling the inclusion criteria to participate in the study .

All primary caregivers of children (age less than 18 years) with type 1 DM on treatment and care for a minimum of 3 months who gave consent to participate in the study were consecutively included into the study. Those primary caregivers of children who have been on treatment for less than 3 months, caregivers who were not primary caregivers, and those who refused to participate in the study were excluded.

Data collection method and procedures: A structured interviewer-administered questionnaire was used to collect all relevant information from study participants. The information collected included socio-demographic information about the caregiver, diabetes-related characteristics and clinical conditions of the caregiver, knowledge about diabetes care, and practice of diabetes care.

The diabetes knowledge test (DKT) was utilized to assess general knowledge of diabetes and components of diabetes care. DKT was developed and tested for reliability and validity by the University of Michigan researchers(13), which was adopted for this study in the context of the Ethiopian diet(12). DKT consists of 23 questions which have been shown to adequately estimate a general patient's/caregiver's knowledge of diabetes related to the 5 domains of adherence to diabetes self-management(13). The total graded questions contained 23 questions, and each correct answer was scored as 1 and each incorrect answer was scored as 0. Then the scores of all items of knowledge were summed up, the mean score was calculated, and this mean was used to categorize participants into those who have poor (scored below the mean) and good knowledge (scored mean or above).

Data about diabetic care activities were collected using the tool "Adherence in Diabetes Questionnaire for the Parent/Caregiver Version (ADQ-P-C)" (14). The tool was adapted to the context of the study area according to the Ethiopian National Diabetic Management Guideline (2). Among the 19-item questions they used, six of them did not apply to our set-up, so we decided to use only 13-item questions. The ADQ 13-item instrument quantifies five areas of practice related to adherence to type 1 DM care recommendations; which are insulin administration (3 items), dietary management (3 items), blood glucose testing (4 items), foot care (1 item), and exercise (2 items). Then a 4-point Likert scale with anchors 1=never, 2= sometimes, 3=almost always, and 4=always was used.

Scoring system: 4 points were given for always, 3 for most of the time, 2 for some time, 1 for never, and 0 for I don't know. Those with scores greater than or equal to the mean were categorized as having good diabetic care practices and those with scores less than the mean were categorized as having poor diabetic

care practices. For each domain of practice, the same thing was applied (15). The questionnaire was translated into local languages (Amharic and Afaan Oromo) and then, back translated to English to check for consistency before data collection.

Data Processing and Analysis

The collected data were checked for completeness and consistency and then cleaned, coded, and entered into EpiData version 6.0. The data were then exported to, cleaned, and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive analysis was used to describe the basic characteristics of the study participants. The mean and median were calculated for continuous variables. The association between variables was tested using binary logistic regression. Multivariate linear regression analysis was performed to determine the factors independently associated with caregivers' diabetes care knowledge and practices. A p-value of less than or equal to 0.05 was considered statistically significant. The degree of association between dependent and independent variables was reported using the adjusted odds ratio (AOR) and 95% confidence interval (CI).

Ethics Approval: Ethical clearance was obtained from the Institutional Review Board of Jimma University **(Ref. No. IRB 1574/33/14**), and permission was obtained from the authorities of the hospital. Written informed consent was obtained from each study participant before enrollment into the study.

Results

One hundred and fifty-eight (94.0%) of the targeted 168 caregivers of children with type 1 DM attending a follow-up clinic at JMC participated in the study; the remaining participants either refused to provide their consent (4, 2.4%) or did not show up during the data collection period (6, 3.6%). The mean age of the caregivers was 39.33± 10.25 (mean ± SD) years . Of the 158 primary caregivers who participated in the study, over half of the study participants were females (93, 58.9%) and children's mothers (86, 54.4%). (Table 1)

Table 1. Socio-demographic characteristics of caregivers of children with type 1 DM in JMC Jimma., Ethiopia, 2022 (n=158)

Variables	Categories	Frequency	Percent (%)
Age (years)	<20	3	1.9
	20-30	35	22.2
	31-40	64	40.5
	>40	56	35.4
Sex	Male	65	41.1
	Female	93	58.9
Relation with the child	Mother	86	54.4
	Father	47	29.7
	Guardian	25	15.8
Marital status	Married	128	81.0
	Unmarried	11	7.0
	Divorced	8	5.1
	Widowed/widower	11	7.0
Residence	Urban	65	41.1
	Rural	93	58.9
Educational status	Can't read and write	59	37.3
	Primary (grade1-8)	40	25.3
	Secondary (9-12)	39	24.7
	College and above	20	12.7
Occupation	Housewife	63	39.9
	Farmer	60	38.0
	Employed	19	12.0
	Merchant	5	3.2
	Daily laborer	11	7.0
Family Monthly income	≤1000 ETB	28	17.7
	1001-2500 ETB	62	39.2
	2501-5000 ETB	39	24.7
	≥5000 ETB	29	18.4

The majority of the children with type 1 DM were diagnosed before reaching 5 years of age (140, 88.6%) and had been on follow-up for less than 5 years (123, 77.8%). Only a few of them (18, 11.4%) had other family members with diabetes. The majority (145, 91.8%) of caregivers (145, 91.8%) have received diabetic education, almost all of them receiving the education from the Hospital (140, 96.6%). (Table 2)

Table 2. Diabetes-related characteristics and clinical conditions of the caregivers of children with type 1 DM attending follow-up clinic, JMC, Jimma, Ethiopia, 2022.

Variables	**Categories**	**Frequency**	**Percent (%)**
Presence of family members with DM	Yes	18	11.4
	No	140	88.6
Age of the child at diagnosis of DM	<5 years	123	77.8
	5-10 years	30	19.0
	>10 years	5	3.2
Duration on flow up	<1year	17	10.8
	1-5 years	106	67.1
	>5 years	35	22.2
Care givers got diabetes education/advice	Yes	145	91.8
	No	13	8.2

The mean and standard deviation of knowledge score among caregivers towards diabetic care was 8.48 ±3.58; and only 43.7% of caregivers had good knowledge. Caregivers had better knowledge regarding the most accurate way of monitoring diabetes (104, 65.8%) whereas the worst response was seen with regard to effect of exercise on blood glucose level (37, 23.4%). Only less than half of the respondents (67, 42.4 %) had good practice towards type 1 DM. Caregivers had better practice with regards to administering insulin at the right times (111, 70%), while the worst response was observed with regards to routine blood sugar monitoring (50, 31.2%). (Table 3)

Table 3: Overall responses of caregivers for the specific questions under the knowledge and practice domain JMC, Jimma, Ethiopia, 2022

Variables	**Proportions of responses**	
	Wrong	Correct
Knowledge questions Glycosylated hemoglobin (hemoglobin A1) is a test that measures your average blood glucose level for the past 6-10 week:	109 (69.0%)	49 (31.0%)
Which is the best method for testing blood glucose?	54 (34.2%)	104 (65.8%)
What effect does unsweetened fruit juice have on blood glucose?	95 (60.1%)	63 (39.9%)
Effect of infection on blood glucose	95 (60.1%)	63 (39.9%)
You realize just before lunchtime that you forgot to give him/her insulin before breakfast. What should you do now?	110 (69.6%)	48 (30.4%)
If your child is beginning to have a low blood glucose reaction, what he/she should do ?	69 (43.7%)	89 (56.3%)
Cause of low blood glucose	47 (29.7%)	111 (70.3%)
If your child takes his morning insulin but skips breakfast, his blood glucose level will usually decrease	72 (45.6%)	86 (54.4%)
Cause of high blood glucose	69 (43.7%)	89 (56.3%)
For a child in good control, what effect does exercise have on blood glucose?	121 (76.6%)	37 (23.4%)
What is the recommended procedure for low blood sugar (hypoglycemia)?	71 (44.9%)	87 (55.1%)
What is best way to take care of your child's feet ?	111 (70.3%)	47 (29.7%)
Signs of ketoacidosis	106 (67.1%)	52 (32.9%)
Practice questions		
Take the amount of insulin that the healthcare provider prescribed	47 (29.7%)	111(70.3%)
Taking insulin at the right times	46 (29.1%)	112 (70.9%
Alternating injection sites to avoid lipohypertrophy	102 (64.6%)	56 (35.4%)
Detect and respond to early signs of low blood glucose	54 (34.2%)	104 (65.8%)
Detect and respond to early signs of high blood glucose	59 (37.3%)	99 (62.7%)
Attend regular check-ups at the diabetes clinic as your health care provider recommended	109 (69%)	49 (31%)
Monitor blood sugar as often as your healthcare provider asked you to	108 (68.8%)	50 (31.2%)
Check feet daily for signs of problems such as ulceration, blisters	78 (49.4%)	80 (50.6%)
Exercising or participating in some form of physical activity (Working in the field such as farming, fetching water, Playing with peer groups such as football or handball)	65 (22.9%)	93 (77.1%)
Remembering to carry "fast sugar" (e.g., carry sweets, sugary biscuits or bread, or the like) to prevent hypoglycemia	70 (44.4%)	88 (55.6%)
Follow an eating plan recommended by a health professional/Eat a balanced diet	61 (42.5%)	97 (57.5%)
Limiting the amount of food she/he eats that contains a lot of sugar or fat (for example cheese, cured meats, sweets, red meat)	76 (40.9%)	82 (59.1%)

The caregivers' residence had statistically significant association with the care givers' knowledge of type 1 DM; the caregivers who reside in urban areas were 3.84 times (AOR=3.53; 95% C.I: 1.81 -6.86) more likely to have better knowledge as compared to those from rural areas. On the other hand, the care givers' gender, attendance of diabetic education, and diabetes knowledge level showed statistically significant associations with their practices; diabetes care practice level was found to be 2.09 times higher in female caregivers (AOR=2.09; 95% CI: 1.04-4.22), 9.48 times in caregivers who attended diabetes education (AOR=9.48;95% CI: 1.17-79.66), and 2.04 times in caregivers who had good diabetes knowledge (AOR= 2.04;95% C.I: 1.03-4.04) than their counterparts (Tables 4 and 5).

Table 4. Multivariable logistic regression model to identify factors associated with the level of knowledge of respondents JMC, Jimma, Ethiopia, 2022 .

Variables	**Category**	**Knowledge Level**		**AOR (95%CI)**
		Good n (%)	Poor n (%)	
Residence	Urban	40(61.5)	25(38.5)	3.53(1.81-6.86)*
	Rural	29(31.2)	64(68.8)	1
Educational status	Can't read and write	21(35.6)	38(64.4)	1
	Primary (grade1-8)	16(40.0)	24(60.0)	0.97(0.39-2.42)
	Secondary (9-12)	18(46.2)	21(53.8)	0.67(0.24-1.85)
	College and above	14(70.0)	6(30.0)	1.76(0.48-6.45)
Family monthly income	≤1000 ETB	7(25.0)	21(75.0)	1
	1001-2500 ETB	21(33.9)	41(66.1)	1.34(0.48-3.72)
	2501-5000 ETB	21(53.8	18(46.2)	2.21(0.67-7.22)
	≥5000 ETB	20(69.0)	9(31.0)	3.67(0.96-14.00)
Attended diabetes education/advice	Yes	66(45.5)	79(64.5)	3.75(0.93-15.13)
	No	3(23.1)	10(76.9)	1
Duration of follow up	<1years	5(29.4)	12(70.6)	1
	1-5 years	46(43.4)	60(56.6)	2.13(0.63-7.21)
	>5 years	18(51.4)	17(48.6)	3.41(0.88-13.19)

AOR: Adjusted Odds ratio, 1: the reference group, *variables that showed statistically significant association with the dependent variable at p <0.05

Table 5. Multivariable logistic regression model to identify factors associated with the practice level of caregivers towards diabetic care, JMC, Jimma, Ethiopia, 2022

Variables	**Category**	**Level of practice**		**AOR (95%CI)**
		Good n (%)	Poor n (%)	
Age of caregivers in years	<20 years	2(66.7)	1(33.3)	1.73(0.13-22.13)
	20-30 years	19(54.3)	16(45.7)	1.68(0.66-4.32)
	31-40 years	26(40.6)	38(59.4)	1.13(0.49-2.65)
	>40 years	20(35.7)	36(64.3)	1
Gender	Male	20(30.8)	45(69.2)	1
	Female	47(50.5)	46(49.5)	2.09(1.04-4.22)**
Educational status	Can't read and write	22(37.3)	37(62.7)	1
	Primary (grade1-8)	15(37.5)	25(62.5)	0.67(0.27-1.67)
	Secondary (9-12)	22(56.4)	17(43.6)	1.00(0.37-2.74)
	College and above	8(40.0)	12(60.0)	0.68(0.21-2.17)
Family monthly income	≤1000 ETB	10(35.7)	18(64.3)	1
	1001-2500 ETB	22(33.5)	40(64.5)	0.72(0.24-2.11)
	2501-5000 ETB	19(48.7)	20(51.3)	1.19(0.33-4.31)
	≥5000 ETB	16(55.2)	13(44.8)	1.44(0.36-5.82)
Attending diabetes education/counselling	Yes	66(45.5)	79(54.5)	9.48(1.17-79.66)**
	No	1(7.7)	12(92.3)	1
Knowledge	Good knowledge	38(55.1)	31(44.9)	2.04(1.03-4.04) **
	Poor knowledge	29(32.6)	60((67.4)	1

AOR: Adjusted Odds ratio, 1: the reference group, and ** variables that showed statistically significant association with the dependent variable at p <0.05.

Discussion

With the current study, we aimed determine the knowledge and practice level of the caregivers of children with type I diabetes mellitus and associated factors at a tertiary hospital located in one of the Low and Middle Income Countries. This is particularly important in order to understand the situation in the local context and address the existing gaps with regard to the knowledge and practices of diabetic care with an ultimate goal of improving the cares given to this group of patients and hence, reduce the associated complications and improve the quality of care of the patients.

Care givers' knowledge is crucial in determining the cares they give to their children with diabetes mellitus which in turn affects the glycemic control of the children(5–8). Consistent with studies done in Ethiopia (12) and Sudan (10), caregivers participating in this study had

poor level of knowledge and practices regarding their children's diabetic cares. This indicates the need for continuous awareness creation activities by healthcare workers taking care of these children with an ultimate goal of improving the cares of such children. Healthcare workers taking care of these children need to regularly assess the knowledge of caregivers (and the children themselves when applicable) and their practices with regard to diabetic cares on every visit or encounter and provide them with the necessary information and feedback so that they have an adequate knowledge and also transcribe the knowledge they acquired to practices which will ultimately improve the cares given to the children.

Apart from the information received from healthcare workers, access to other sources of information regarding care of children with diabetes is important in improving the knowledge and practices of care givers is important. In this study, participants from urban residence were found to have a better mean knowledge score level compared to residents from rural area. This is similar to other studies conducted in Egypt (9) and Ethiopia (12). This difference could be explained by the better access to potential sources of information (radio, television, internet, etc.) in urban areas compared to rural areas.

On the other hand, there was a significant association observed between the gender of the caregivers and their practices regarding diabetic cares; female caregivers were two times more likely to have good practice. This might be due to the fact that most of the time, mothers as caregivers, might be spending their time with the children and providing diabetic care to their children; more than half of the caregivers in our study were also mothers. This finding is supported by findings from other studies conducted in India (5) and Bangladesh (8). Even if all family members of children with DM need to receive the necessary education in order to improve the cares provided to the children, these findings might indicate whom to target for such interventions to get the maximum benefits from the intervention.

As is expected and is seen in other studies (8,9,16), attending diabetes education sessions is found to be associated with better practice of diabetic care in the current study, indicating the need to provide continuous education for caregivers in order to improve caregivers' practices. Having good knowledge level is positively associated with having good diabetic care practices reinforcing the need to improve caregivers' knowledge. The fact that the study relied on reported caregiver's knowledge and practice, which may not reflect their actual performances can be taken as the limitation of the study.

In conclusion, the caregivers' knowledge and practice with regard to diabetic cares in this study is poor. Urban residence was associated with good knowledge whereas caregivers' gender, attending diabetes education and caregivers' knowledge were associated with good

practices. Healthcare professionals taking care of children with diabetes should regularly and continuously educate caregivers in order to improve the knowledge and practices of caregivers.

Declarations

Ethical considerations: Ethical clearance was obtained from the Institutional Review Board of Jimma University (**Ref. No. IRB 1574/33/14),** and permission was obtained from the authorities of the hospital. Written informed consent was obtained from each study participant before enrollment into the study.

Authors' contributions: BG conceptualized the idea, designed the methods, developed data collection tools, supervised the data collection, conducted the data analysis and drafted the manuscript. MB supported the study design, reviewed the study protocol and tool and reviewed the draft manuscript. BG and MB reviewed and approved the final version of the manuscript.

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ORIGINAL ARTICLE

VITAMIN D LEVELS IN PEDIATRIC EPILEPSY PATIENTS ON THE ANTI-EPILEPTIC DRUGS AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA

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ABSTRACT

***Background**: Epilepsy is a common neurological disorder of childhood repeatedly necessitating prolonged use of anticonvulsants. This study was done to evaluate the status of vitamin D in epileptic children. We targeted to describe the prevalence and risk factors for vitamin D deficiency among children with epilepsy.*

***Methods**: A hospital-based descriptive cross-sectional study design with prospective data collection was used among children with epilepsy on anti-epileptic drugs attending the Pediatric Neurology Clinic and their primary caretakers. For this study, a sample of 226 children and adolescents were included in the study and a blood sample for the determination of serum vitamin D was taken. The participants were interviewed, and medical records were thoroughly reviewed. Descriptive statistics and binary logistic regression analysis was done to assess determinants of vitamin D deficiency. .*

***Results**: In this study, the prevalence of vitamin D deficiency was found to be 42%. Children on polytherapy (AOR = 4.3 (1.2 - 16)), 3 or more AEDs (AOR = 0.1 (0.0 - 0.8)), female sex (AOR = 1.8 (1.7 - 2.6)), age >15 years (AOR = 2.12 (1.0 - 1.5)), 4 months of exclusive breastfeeding (AOR = 5.6 (4.9 - 36)), family diet (AOR = 0.3 (0.1 - 0.8)) and non-ambulation (AOR = 1.7 (1.8 - 3.6)) were factors associated with being in the vitamin D deficiency group.*

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***Conclusion**: According to this study patients who take Anti-Epilepsy drugs are at a higher risk of a poor vitamin D status. Based on this finding, the need for timely and appropriate vitamin D supplementation and periodic follow-up seems to be very evident.*

Key Words: Anti-epilepsy drugs, Vitamin-D deficiency, Children, Ethiopia

INTRODUCTION

Vitamin D is essential for human health because it regulates calcium and bone metabolism. It helps the body absorb calcium and phosphorus from food and prevents parathyroid hormone from being released. Low levels of vitamin D can lead to bone problems such as rickets, osteopenia, and osteoporosis. Moreover, vitamin D deficiency may increase the risk of various diseases such as cancers, autoimmune disorders, hypertension, and infections (1,2).

Vitamin D3 levels below 30 ng/mL, which indicate insufficiency or deficiency, affect about one billion people worldwide (3). Anti-epileptic drug (AED) therapy in children is a known risk factor for impaired bone health (4–7). Hepatic CYP450 enzyme-inducing anti-seizure medication affects bone health by increasing the hepatic metabolism of vitamin D (8).

Other non–enzyme-inducing anti-epileptic drugs like sodium valproate can impact bone health via direct effects on bone cells, resistance to parathyroid hormone, and inhibition of calcitonin secretion (7,8). Anti-epileptic drug therapy, particularly long-term anti-epileptic drug therapy, and poly-therapy is known to be associated with Vitamin D Deficiency which negatively contributes to bone health (8–10).

Impaired bone health results in low bone mineral density and osteoporotic fractures in childhood and later adult life (11). Among Ethiopian adolescents aged 11 to 18 years, a study found that 42% had vitamin D deficiency ((25 OH) D below 50 nmol/l). Of these, 61.8% lived in urban areas and 21.2% lived in rural areas (12).

Particularly the occurrence of low bone density has been recognized as a risk factor for fractures in childhood (13–15). Augmenting vitamin D status by supplementation of Vitamin D during childhood can be the vital clinical approach to maximize peak bone density in children and with this improve bone mineral density and reduce fracture risk (16). It also has a significant effect on adult fracture rates (17). Several papers recommend episodic vitamin D level testing and vitamin D supplementation in children receiving long-term anti -epileptic drugs (8,18–20). This study aimed to assess Vitamin D status among children with epilepsy on anti-epileptic drugs in Addis Ababa, Ethiopia.

MATERIALS AND METHODS

Study design and setting

The study was conducted at Tikur Anbesa Specialized Hospital, an 800-bed hospital that evaluates more than 100,000 patients annually. The hospital has 18 departments, including pediatrics, which has 180 beds for patients

aged one to 14 years. The pediatric neurology clinic is one of the clinics that sees 20 patients per day, of which 80% have follow-up visits for seizure disorders. This is cross-sectional study was carried out among patients who were on anticonvulsant treatment and were on follow up at neurologic clinic. Monthly case-load at the pediatric neurologic clinic is 320 patients, including those who came for repeated follow-up visits.

Study Period

The study was conducted over a one-year period between June 2019 and 2020.

Study Population

Our study group consisted of children aged 6 months to 16 years who had epilepsy and had been on antiepileptic drugs (AEDs) for at least six months.

Inclusion and exclusion criteria

The study included consenting pediatric patients who were on anti-epileptic drugs for the last six months at pediatric neurologic clinic The study excluded children who had medical conditions that affected bone metabolism, such as liver, kidney, metabolic, or hormonal disorders, or chronic diseases, such as cancer, diabetes, or GI tract issues, children who had moving disorders, or who took other medications that could cause neuromuscular diseases, such as Vitamin D/ Calcium supplements or corticosteroids.

Sample size and sampling technique

The sample size was calculated using the following formula and with p taken as 0.22 based on literature review in a setup with a similar context of pediatric patients on AEDs (21). Accordingly, 249 children were calculated for the current study.

$$N = \frac{Z^2 * p * (1-p)}{e^2} = \frac{1.96^2 * 0.22 * (1-0.22)}{0.05^2} \sim 264$$

However, with 14.4% of the collected data being incomplete made the sample size 226. All eligible participants, based on the inclusion and exclusion criteria, were invited to participate in the study. However, only a few parents of the patients consented to be part of the research. The lack of incentive was the main reason for the low number of participants. The study enrolled one patient per day on average until the calculated sample size was reached. A structured questionnaire, adapted from a previous study, was used for data collection (22). The quality of data collection was secured by the regular supervision of the primary investigator.

Blood sample collection procedure and measurements

We obtained 2 ml of peripheral venous blood from the participants after getting their informed consent. The pediatric nurses at the neurology clinic drew the blood using aseptic techniques. We immediately transported the blood to an outside hospital laboratory where we measured the serum 25(OH)D level.

Operational Definition

We diagnosed vitamin D deficiency when the serum 25(OH)D level was <20 ng/ml, vitamin D insufficiency when it was 20-30 ng/ml, and normal vitamin D status when it was 30-100 ng/ml (21,23).

Vitamin D Deficient Group: Defined as children with vitamin D insufficiency and deficiency.

Vitamin D Non-Deficient Group: Defined as children with a normal Vitamin D status.

Seizure: Defined as a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain (24).

Epilepsy: Defined as the clinical diagnosis requiring the occurrence of at least 1 unprovoked epileptic seizure with either a second episode or enough EEG and clinical information to convincingly demonstrate an enduring predisposition to develop recurrences (24).

Complete seizure control: Defined as complete remission of seizure for six months or more (24).

Partial seizure control: Defined as more than fifty percent reduction of frequency of seizure (24).

Poor seizure control: One or more seizure per month over period of 6 months or more and who had experienced trials of at least two different AEDs at optimum doses alone or in combination with adequate compliance (24).

Data Analysis

After data was cleaned and entered, analysis was completed using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were done using frequency distribution tables, chi-square test was employed. Crude odds ratios and adjusted odds ratios with their corresponding 95% CI were calculated and a p-value of 0.05 was taken as statistically significant. Statistically significant associations were described using Odds ratio (OR) and Adjusted odds ratio (AOR) with CI for predictors deemed to be strongly associated to vitamin D status based on literature review.

Results

Sociodemographic characteristics

Of the 226 patients studied, 83 (36.7%) participants were between 5-10 years, while the other 56 patients accounting for 24.3% were in the age group of 10 - 15 years. 35.8% of the participants were between the age range of 6 months to 15 years. More than half or 138 (60.6%) of the participant were males, making the male-to-female ratio 1.5:1. Most of the study participants meaning 156 (69%), were residents of Addis Ababa (Table 1).

Table 1. Descriptive characteristics of children with seizure disorder attending follow-up at Pediatrics Neurologic Clinic in TASH, 2020.

Characteristics	**Category**	**N (%)**
Age	6 months - 5 years	81 (35.8)
	5 - 10 years	83 (36.7)
	10 - 15years	55 (24.3)
	≥ 15years	7 (3.1)
Sex	Female	89 (39.4)
	Male	137 (60.6)
Birth Order	First	122 (54)
	Second	44 (19.5)
	Third	31 (13.7)
	More	29 (12.8)
Family Size	Two	25 (11)
	Three	53 (23.5)
	Four	52 (23)
	Five	43 (19)
	Six and above	53 (23.5)
Address	Addis Ababa City	156 (69)
	Oromia Region	48 (21.2)
	Amhara Region	13 (5.8)
	SNNPR	7 (3.1)
	Others	2 (0.9)
Religion	Muslim	58 (25.7)
	Orthodox	139 (61.5)
	Catholic	3 (1.3)
	Protestant	25 (11.1)
	Other	1 (0.4)
Primary Care Giver	Mother	97 (42.9)
	Father	33 (14.6)
	Both parents	82 (36.3)
	Adult relatives	12 (5.3)
	Nonrelatives	1 (0.4)
	Orphanage	1 (0.4)
Marital Status	Single	19 (8.4)
	Married	182 (80.5)
	Divorced	21 (9.3)
	Widowed	4 (1.8)
Primary caregiver level of education	Can't read or write	13 (5.8)
	Can read or write	17 (7.5)
	Attended Grade 1 – 8	76 (33.6)
	Attended Grade 9 - 12	61 (27)
	College Level Education	59 (26.1)

Child feeding and related characteristics.

Out of the 226 mothers, 24 (10.6%) practiced breastfeeding at the time of data collection, while 157 (69.5%) had exclusively breast-fed for six months in the past.

Table 2. Child feeding and related characteristics of children with seizure disorder attending follow-up at Pediatrics Neurologic Clinic in TASH, 2020

Characteristics	Category	N (%)
Mode of child feeding at the time of data collection	Exclusive Breast Feeding	24 (10.6)
	Formula Milk	8 (3.5)
	Cow milk	7 (3.1)
	Combination of Breast and Formula Milk	8 (3.5)
	Combination of Breast and Cow Milk	5 (2.2)
	Family Diet	172 (76.1)
	Others	2 (0.9)
Historical Months of Exclusive Breast Feeding	One Month	18 (8)
	Two Months	7 (3.1)
	Three Months	24 (10.6)
	Four Months	11 (4.9)
	Five Months	9 (4)
	Six Months	157 (69.5)
Frequency of Sunlight exposure per week	One Day	28 (12.4)
	Two Days	38 (16.8)
	Three or more days	151 (66.8)
	No exposure	9 (4)
Average Duration of Sunlight exposure	Less than 20 minutes	55 (24.3)
	20 to 30 minutes	88 (38.9)
	More than 30 minutes	83 (36.7)
Use of skin Ointments	Yes	97 (42.9)
	No	129 (57.1)
Ambulation Status	Ambulating	158 (69.9)
	Not Ambulating	68 (30.1)

Serum Vitamin D level of respondents

The mean vitamin D level of the participants was 24.8 ng/mL (SD ± 12.7), and the median was 21.5 with an Interquartile range between 16.4 and 31.4, the minimum and maximum serum Vitamin-D levels determined were 3.8 ng/mL and 70ng/ml, respectively. 41.6% of participants were found to be in the deficient group. (Figure 1)

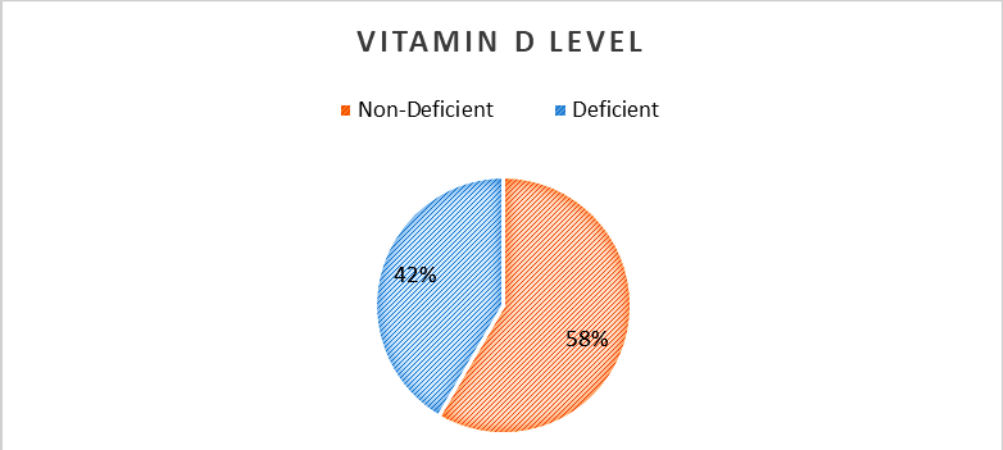

Figure 1. Results of Vitamin D level in children taking AEDs in TASH, Pediatric Neurologic Clinic August 2020

Table 3 shows that of the 89 female participants 42 (47%) were in the Vitamin D Deficient group while only 52 (38%) of the 138 male participants were in the vitamin D deficient group. Furthermore, 71 (45%) of the 156 participants from Addis Ababa were in the Vitamin D Deficient group while only 23 (33%) of the 70 participants from outside of Addis Ababa were. (Table 3)

Table 3. Comparison of Vitamin D Deficient and Non-Deficient groups of children on AEDs attending and followed at TASH, pediatric neurology clinic August 2020.

Characteristics	**Category**	**Frequency (%)**	**Vitamin D status, N (%)**	
			Deficient	Non-Deficient
Age	6 month-5yrs	81 (35.8)	29	52
	5-10 years	83 (36.7)	35	48
	10-15years	55 (24.3)	24	31
	>=15years	7 (3.1)	6	1
Sex	Female	89 (39.4)	42	47
	Male	138 (60.6)	52	85
Address	Addis Ababa	156 (69.0)	71	85
	Out of Addis Ababa	70 (31%)	23	47

Seizure-related information and vitamin D level

The majority of the study participant that is 146 (64.6%) had a Generalized Tonic Clonic (GTC) type of seizure while focal seizures were observed in 73 (32.3%) of the participants. Regarding the type of AEDs and vitamin D deficiency, most participants, 139 (61.5%) were on monotherapy.

As shown in Table 4, among the 146 participants who had GTC type seizure 55 (38%) were in the vitamin D deficient group. While among the 73 participants who had focal seizure 36 (49%) were in the vitamin D deficient group. Furthermore, of the 87 participants who were on polytherapy 35 (40%) were in the vitamin D deficient group. While among the 139 participants who were on monotherapy 59 (42%) were in the vitamin D deficient group.

One hundred fifty-two (67.3%) of the participants used Enzyme Inducing AEDs (EI-AEDs), and among these 67 (44%) were in the vitamin D deficient group. Of the 43 participants consuming Non-Enzyme Inducing AEDs (NEI-AEDs), 16 (37.2%) were in the vitamin D deficient group. Finally, among the 31 participants using a combination of both groups of drugs 35.5% were in the vitamin D deficient group. (Table 4)

Table 4. Seizure-related findings of children on AEDs attending and followed at TASH, pediatric neurology clinic 2020.

Characteristics	**Category**	**Frequency (%)**	**Vitamin D status, N (%)**	
			Deficient	Non-Deficient
Seizure Types	Generalized	146 (64.6)	55	91
	Focal	73 (32.3)	36	37
	Unknown onset	7 (3.1)	3	4
Number of AEDs used	Monotherapy	139 (61.5)	59	80
	Polytherapy	87 (38.5)	35	52
Address	Addis Ababa	156 (69.0)	71	85
	Out of Addis Ababa	70 (31%)	23	47
Type of AED	Enzyme Inducing AEDs	152 (67.3)	67	85
	Non-Enzyme Inducing AEDs	43 (19)	16	27
	Combination of EI-AEDs and NEI-AEDs	31 (13.7)	11	20
Seizure control	Well controlled	91 (40.3)	39	52
	Partial controlled	112 (49.6)	46	66
	Poor controlled	23 (10.2)	9	14

Vitamin D level and clinical signs

Half of the participants who were taking AEDs for more than 3 years were in the vitamin D deficient group. Majority 214 (94.7%) of participants who were in the vitamin D deficient group did not have clinical manifestation.

Table 5. Vitamin D level of children on AEDs attending and followed at TASH, pediatric neurology clinic 2020

Characteristics	**Category**	**Frequency (%)**	**Vitamin D status, N (%)**	
			Deficient	Non-Deficient
Duration of therapy	6 month-2 years	89(39.4)	31	58
	2-3 years	40(17.7)	15	25
	>3 years	97(42.9)	48	49
Clinical signs of rickets	Yes	12(5.3)	5	7
	No	214(94.7)	89	125
Signs of Rickets	Frontal bossing	2	1	1
	Wrist widening	8	3	5
	Rachitic rosary	3	1	2

Factors predicting vitamin D status.

In the bivariate and multivariable logistic regression analysis of potential risk factors of being in the vitamin D deficiency group were sex, age, number of AEDs, duration of AEDs treatment, ambulatory status, and duration of daily sun exposure showed a statistically significant association ($p < 0.04$) with being in the vitamin D deficient group. Female participants had statistically significant risk of having vitamin D deficiency ($P < 0.03$). Non ambulating participants has a higher chance of being in the vitamin D deficiency group ($P < 0.04$). The participants who received poly antiepileptic drugs had significant odds of being in the vitamin D deficiency group ($P <0.03$). A significant odd of being in the vitamin D deficiency group ($p = 0.01$) was observed in participants whose age was greater than 15 years. (Table 6)

Table 6. Results of bivariate and multivariate regression model of risk factors for being in the vitamin D deficiency group in children taking AEDs in TASH, Pediatric Neurologic Clinic 2020

Characteristics	**Category**	**COR (95% CI)**	**P - value**	**AOR (95% CI)**	**P - value**
Age	6 month - 5 years	1		1	
	5 - 10 years	1.4 (0.8 - 2.7)	0.25	0.1 (0.1 - 1.2)	0.07
	10 - 15 years	1.3 (0.7 - 2.7)	0.41	0.2 (0.1 - 1.8)	0.14
	≥ 15 years	10.8 (1.2 - 93)	0.03	2.12 (1.0 - 1.5)	0.01
Sex	Female	1.5 (0.87 - 2.5)	0.14	1.8 (1.7 - 2.6)	0.03
	Male	1		1	

Birth order	First	1		1	
	Second	2.4 (0.9 - 5.9)	0.07	1 (0.5 - 2.5)	0.85
	Third	2.6 (0.9 - 7.4)	0.07	1.3 (0.5 - 3.2)	0.63
	Fourth or more	3.3 (1.1 - 10)	0.03	0.4 (0.1 - 1.1)	0.08
Mode of Feeding	Breast milk	1		1	
	Formula milk	0.8 (0.2 - 4.4)	0.81	1.3 (0.2 - 8.3)	0.79
	Cow milk	0.4 (0.1 - 2.1)	0.26	0.2 (0.1 - 1.6)	0.13
	Breast milk and Formula milk	0.2 (0.1 - 1.2)	0.05	0.1 (0.1 - 1)	0.07
	Breast milk and Cow milk	0.3 (0.1 - 2.4)	0.28	0.3 (0.0 - 5.3)	0.43
	Family diet	0.3 (0.1 - 0.8)	0.01	0.3 (0.1 - 0.8)	0.02
	Others	****			
Month of exclusive feeding	1 month	1.5 (0.6 - 3.9)		1.1 (0.3 - 3.6)	0.86
	2 months	1.1 (0.2 - 5.0)	0.92	0.9 (0.2 - 5.5)	0.95
	3 months	0.7 (0.2 - 1.8)	0.53	0.7 (0.3-1.9)	0.49
	4 months	6.6 (1.4 - 3.6)	0.02	5.6 (4.9 - 36)	0.04
	5 months	0.7 (0.2 - 3)	0.67	1.1 (0.2 - 6.5)	0.90
	6 months	1		1	
Duration of sunlight exposure	< 20 min	2.4 (1.5 - 2.9)	0.03	0.8 (0.3 - 1.9)	0.64
	20-30 min	0.7 (0.4 - 1.2)	0.18	0.6 (0.3- 1.4)	0.24
	>30 min	1		1	
Skin ointment application	Yes	0.8 (0.5 - 1.4)	0.46	1.0 (0.5 - 1.9)	0.96
	No	1		1	
Ambulation status	Ambulating	1		1	
	Not ambulating	1.7 (0.9 - 3)	0.07	1.7 (1.8 - 3.6)	0.04
Seizure type	Generalized	1		1	
	Focal	1.5(.84-2.6)	0.17	1.6 (0.8 – 3.0)	0.19
	Unknown	1.2(.25-5.4)	0.84	2 (0.3 - 12.6)	0.43
Number of AEDs used	One	1		1	
	Two	0.9 (0.6 - 1.8)	0.97	0.4 (0.1 - 1.2)	0.09
	≥ Three	0.7 (0.2- 2.3)	0.52	0.1 (0.0 - 0.8)	0.03
Duration of therapy	6 months - 2 years	1		1	
	2 - 3 years	1 (0.5 - 2.3)	0.86	1.5 (0.6 - 3.6)	0.42
	> 3 years	1.8 (1.9 - 3.2)	0.01	1.6 (0.7 - 3.6)	0.26
AEDs based on drug generation	EI-AEDs	1		1	
	NEI-AEDs	0.9 (0.4 - 1.9)	0.85	0.9 (0.4 - 2.2)	0.86
	EI -AEDs & NEI-AEDs	0.8 (0.3 - 1.7)	0.48	0.6 (0.2 - 1.9)	0.33
AEDs based on drug combination	Monotherapy	1		1	
	Poly-therapy	1.4 (0.7 - 2.4)	0.28	4.3 (1.2 - 16)	0.03

DISCUSSION

We conducted a observational study with prospective data collection to examine the effect of anticonvulsants on vitamin D levels. We found that patients who had used anticonvulsants for more than 3 years had significantly lower vitamin D levels. Out of 226 participants, 95 had vitamin D deficiency. This prevalence was lower than that reported in India (25), but higher than that reported in Iraq and other countries (21,23,25,26). We also observed that the age group of above 15 years had the highest percentage of being in the vitamin D deficiency group. This finding was inconsistent with the studies from India (25) and Iraq (26), where the highest proportion occurred in younger age groups. Moreover, we found that the duration of antiepileptic drug use was a risk factor for poor vitamin D status. Female sex was associated with a nearly twofold higher risk of being in the vitamin D deficiency group than male sex (AOR 1.8 and 95% CI= 1.7, 2.6). This finding was consistent with the studies in India, Iraq, Malaysia, and others (21,23,25–27), but not with Ramya's study (28). We could not explain this difference, but another study (29) reported lower vitamin D levels in healthy girls. This could be due to the less sun exposure and outdoor activities of girls than boys.

Our study agreed with Teagarden et al. (30) that patients with epilepsy who used enzyme-inducing antiepileptic drugs had higher odd of being in the vitamin D deficiency group than those who used non-enzyme-inducing antiepileptic drugs. This could be because old antiepileptic drugs induce cytochrome P450 enzymes, which alter vitamin D metabolism, while new antiepileptic drugs do not or do so minimally. Most of our patients used old antiepileptic drugs, which could explain the poorer vitamin D status.

The most common antiepileptic drugs in our study were Enzyme Inducing AEDs such as phenytoin (29%), phenobarbital (21%), sodium valproate (14.9%), and carbamazepine (3.9%). We found that phenytoin (50%), sodium valproate (35%), and phenobarbital (30.6%) were significantly associated with vitamin D deficiency. This finding differed from other studies (31–35).

Lee et al. (36) conducted a longitudinal study of 143 epileptic children who were exposed to AEDs for 2 years and found that a high proportion of them had hypovitaminosis D. Our study also revealed that having a poor vitamin D status was more prevalent among children with seizure therapy >3 years, adolescent age >15 years old, and non-ambulating status. These findings are consistent with earlier studies (25,26,37,38) .

Rauchenzauner et al (39) reported that non-enzyme inducing AEDs did not cause vitamin D deficiency in healthy children on monotherapy. Our study found that polytherapy increased the risk of a poorer vitamin D status compared to monotherapy. This finding agreed with one study (31) but disagreed with another study by Ramya et al. (28).

In our study, we found hundred forty-six patients had generalized seizures, and 74 suffered from partial seizures of these a decreased vitamin D level was observed in patients with generalized seizures. It was in agreement with the study done in India (25). In the current study, we have found that vitamin D levels ranged between 3.8, and 70 nmol/L, with a mean of 24.8 nmol/L, which was lower than the findings in the Malaysian and Australian studies (21,23).

Limitation of the study

We acknowledge some limitations of our study: we conducted it in one tertiary hospital, which may limit its generalizability and may not be representative of the national burden. We did not measure the baseline vitamin D levels before starting the treatment. We also did not consider other risk factors for vitamin D deficiency, such as dietary intake of vitamin D and calcium. Moreover, we did not distinguish between insufficiency and deficiency in our analysis, which makes our conclusion and recommendations less specific, as they require different interventions.

CONCLUSION

Poor vitamin D status including insufficiency and deficiency was found to be highly prevalent among children with epilepsy on AEDs. Almost half of the children with AEDs were at risk of poor vitamin D status. Increased duration of AEDs therapy lower daily sunlight exposure, female gender, and poor ambulation was associated with a higher risk of a poor vitamin D status. Based on this finding, the need for timely and appropriate vitamin D supplementation and periodic follow-up seems to be very evident.

Availability of data and material

The data used for analysis for the current study are available from the corresponding author.

Abbreviations

AED: Anti-epileptic Drugs

CYP450: Cytochrome P450

EI-AED: Enzyme Inducing Anti-epileptic Drugs.

GTC: Generalized Tonic Clonic Seizure

SPSS: Statistical Package for Social Sciences

TASH: Tikur Anbessa Specialized Hospital

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Ethical Clearance

The research and publication committee of the department of pediatrics and child health approved the Ethical Clearance. The ethical approval number was DRPC/008/12 and it was approved on April 23 2019. The study participant parents, and children older than 12 years

gave their informed consent and assent respectively after learning about the purpose, significance, and blood sample of the study. It is a routine practice to take a blood sample for a patient who is on an antiepileptic drug. Furthermore, the participants were informed that they had the right to opt out of the study at any time. The data collection was done anonymously, and the information was protected and confidential.

Competing interests

There is no competing interest with all authors.

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Authors' contributions

MM – Proposal development, and manuscript writing

AM – Data collection and analysis

MT - Advised on proposal development, oversaw study implementation, and manuscript writing.

ML – Data analysis

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ORIGINAL ARTICLE

DISCHARGE AGAINST MEDICAL ADVICE IN PEDIATRIC WARDS AT TERTIARY CENTER IN ADDIS ABABA, ETHIOPIA: A RETROSPECTIVE CROSS-SECTIONAL SURVEY.

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ABSTRACT

***Background**: Children are at high risk of problems related to discharge against medical advice (DAMA). Because they are not part of the decisions their best interests may be violated. This study is aimed to determine the prevalence, clinical outcomes, and factors associated with discharge against medical advice.*

***Methods**: We cross-sectionally described 123 admissions in which caretakers decided to discharge against medical advice. A mixed data collection method from the patient's charts and telephone interviews was employed. A pretested semi-structured questionnaire tool was used. The data was manually cleaned and analyzed using SPSS software version 25, USA. The frequency and percentage of categorical data were calculated, as well as the mean, median, SD, and IQR of the continuous variable. A multivariate regression analysis was performed, with an adjusted odds ratio of 95% CI and a statistical significance of 0.05.*

***Results**: Hospital prevalence of DAMA was 1.42%. The median age was 11(±59) months—eighty -one percent of the caretakers signed before leaving the hospital. The median hospitalization was 7 days (IQR=13 days). The majority of the caretakers were discharged during working hours (71%). Discharge was registered in all seasons: winter (31%), spring (28%), summer (23%), and autumn (18 %). Hemato-oncologic conditions, infectious, and neonatal problems were common. Most of the cases were reported from pediatric emergency and neonatology wards. Patients' poor clinical response and the caretaker's financial constraints were the main reasons for signing DAMA. Death was significant when the DAMA occurred in fast-improving cases and infants; (AOR=6.909, 95% CI-2.191-21.782), and AOR=1.3, 95% CI -0.48-3.3) respectively.*

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***Conclusion**: DAMA in the Pediatric wards of Tikur-Anbessa Specialized Hospital was similar to the reported data elsewhere. However, death was very high which could be due to insufficient follow-up after DAMA.*

Key Words: Discharge against medical advice (DAMA), pediatric admission, Tikur Anbessa Hospital

INTRODUCTION

When a caretaker decides to take a sick child off the hospital before the treating physician recommends it, this is referred to as discharging against medical advice (DAMA), also known as "self-discharge" or "discharge at own risk". The issue of leaving care settings against medical advice is poorly understood and addressed, despite its prevalence and negative impact on quality and safety (1). Every time a patient departs against medical advice, he or she may be vulnerable to significant consequences, such as permanent disability or death. If a patient requires additional urgent or emergent care following self-discharge, it will often be with the use of a disproportionate amount of healthcare resources (2, 3).

Financial constraints, parental perception that the child is well, disruption of family business, preference for traditional medicine, and loss of hope in the clinical course are some of the predictors of DAMA in developing countries (4). It is assumed that the magnitude of the problem is much higher in poor socio-economic countries as compared to better socio-economic communities (5). Reported predictors of DAMA in children include age under 2 years or adolescents, male sex, duration of hospital stay ≤ 48 hours, financial constraints, lack of health insurance, and low socioeconomic status (6,7). In low and middle-income (LAMI) countries like Africa and the Middle East, the rates of DAMA in children ranged from 1.5% to over 6% (4, 8). DAMA rates in low and middle-income countries may be twice as high as in high-income countries, according to some estimates (9).

The attitude of healthcare providers also affects DAMA. Reports showed that the provider-patient relationship directly affects patients' decisions to leave against medical advice (10, 11). For healthcare professionals, patients who signed DAMA create clinical, moral, practical, and legal issues (2,12). It was recommended that Healthcare professionals can prevent DAMA by actively listening, understanding patient discomfort, and using de-escalation tactics. When DAMA is inevitable, follow-up plans should be created and patients informed that they may return. Patients should also be educated and recommended alternative therapies. If a patient is in danger, follow-up calls or home visits are recommended.

In many African nations, traditional medicine (TM) is used as an alternate option to replace missed treatment due to DAMA. Due to its accessibility and affordability, it is frequently

used in low-income countries when conventional medicine is not accepted by patients and caretakers (13). Reports showed that patients and caretakers experienced DAMA less frequently when hospitalization is planned than it is emergency admission (14).

It is assumed that the problem of DAMA is significant and contributes essentially to child mortality in our settings. However, we are unaware of any published data on the topic in the pediatric age group. Therefore, to determine the hospital prevalence of pediatric DAMA, contributing factors, and its outcome, we aimed to conduct this study in the largest tertiary hospital in Addis Ababa.

Methods

Study Design and period: Instances of DAMA were described among pediatric admissions cross-sectionally between April 1, 2018, and April 1, 2020.

Study site

The study was conducted at the main referral hospital in Addis Ababa. Tikur-Anbessa Specialized Hospital (TASH) is a university hospital serving as a training facility for medical students (undergraduate and postgraduate levels), nurses, midwives, pharmacists, and laboratory and radiology technologists. TASH has over 700 operational beds and treats more than 400,000 patients annually. The pediatric department, includes pediatric emergency, Neonatology, and Pediatric intensive care units, pediatric under-5 and above-5 wards, a pediatric surgical, oncology, and orthopedics wards.

Study Population

The study population is pediatric admissions between April 1, 2018, and April 1, 2020, with discharge against medical advice or leave without notifying the medical team. Cases having complete data and volunteer caretakers for telephone interviews were included in the data collection.

Exclusion criteria: -DAMA cases with grossly deficient data, or whose caretakers were not willing or not available for telephone interview were excluded.

Sample size determination

The sample size was determined to be 112 using a single population proportion formula, with a DAMA prevalence of 7.9%, a 95% confidence interval (CI) of z=1.96, and a 0.05 margin of error. The total sample size was 123 after a 10% non-responder rate was added.

Sampling Procedures

Stratified sampling was used to get cases from each ward. The study subjects were chosen using a systematic sampling based on the caseload in each ward. The first case was chosen by lottery method, followed by every other case, and so on until the target sample size was reached.

Variables

Family sociodemographic information, such as age, gender, occupation, income, marital status, number of children, level of education, and monthly income of caretakers were collected either from the child's medical record

or telephone interviews. The patients' characteristics such as age, gender, admission diagnosis, cause of DAMA, and outcome of DAMA were also gathered. The variables considered in the analysis were presented in the conceptual framework below (Fig 1).

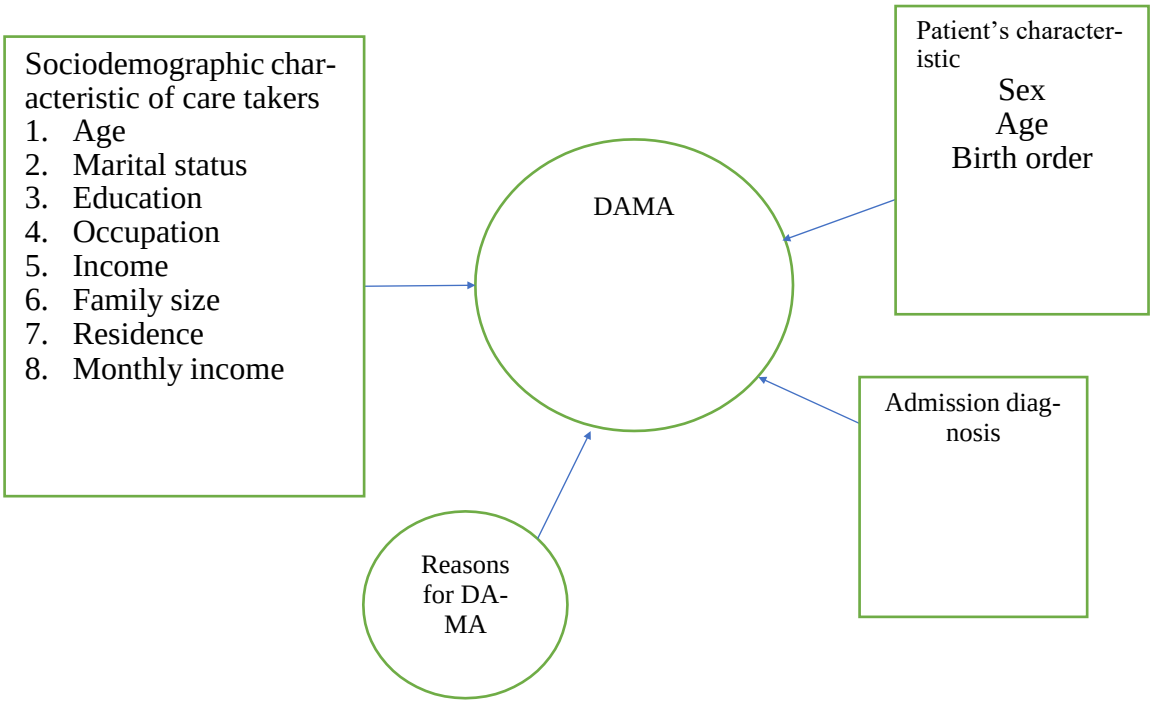

Figure 1: Conceptual framework showing the relation between the outcome variable and explanatory variables considered in the analysis. TASH, 2021.

Data collection tool

A pre-tested, structured questionnaire was used to gather data. After studying earlier studies on the same topic, the questionnaire was prepared in Oromifa, English, and Amharic, it was modified before the data collection began in light of the pretest findings.

Data entry and Analysis

Before data entry, the data was checked through a data-cleaning process for outliers, missed values, and discrepancies. SPSS software, version 25 from IBM USA, was used to analyze the data. Descriptive statistics such as numbers, frequencies, and percentages were used to describe the categorical data. We also computed the odds ratios (OR) and the multivariate regression analysis to quantify the relationship between the independent and outcome variables. Statistical significance was defined as a 95% confidence interval and a p-value below 0.05. The findings were presented in tables and graphs.

Operational Definitions

Admission: -. Means admission as an inpatient to a hospital, for a stay of twenty-four hours or longer for medically necessary and Appropriate care and treatment of illness or injury.

DAMA: - DAMA is defined as a situation in which a patient decides to leave the hospital against the recommendation of the treating Physician. A child was considered a DAMA case, upon signing the hospital's standard discharging form by the parents or guardians (1).

LAMA: - refers to a condition in which the patient insists on leaving the hospital against the medical advice. Without notifying the medical unit.

Summer: (kiremt or Meher) includes June, July, and August are the summer season. Heavy rain falls in these three months. Spring: (tseday)- September, October, and November are the spring season sometimes known as harvest season. Winter: (bega) –December, January and February are the dry season. Autumn: (belg) -March, April, and May are the autumn season with occasional showers. May is the hottest month in Ethiopia. Mortality refers to all deaths following DAMA. Readmission refers to readmission within 30 days of DAMA.

Result

The mean and median patient ages were 36.8 (±4.5) and 11(±59) months. The majority (64.2%) of the admitted cases were males. Most (54%) are aged 12 months or below. DAMA occurrence is bimodal, either in the first 72 hours or between 10-30 days of admission. First child (34.1%) and Second child (28.5%) accounted for most DAMA cases (Table 1).

Table 1: Sociodemographic characteristics of cases, TASH, 2021.

Variables		**Number**	**Percent**
Patient's sex	Male	79	64.2%
	Female	44	35.8%
Age	Mean (SD)	36.8(4.5)	
	Median (IQR)	11.0(59)	
Age category	Neonate	41	34%
	Infant (1mon-1 year)	25	20%
	Preschoolers (1-5 years)	31	25%
	School-age (6-11 yrs)	16	13%
	Teens (> 11years old)	10	8%
Birth order	First child	42	34.1%
	Second child	35	28.5%
	All other	46	37.4%
Duration of hospital stay at DAMA	0-3days	46	37.4
	4-10days	29	23.6
	11-30 days	42	34.1
	>30 days	6	4.9%

Caretakers Characteristics

In terms of age, the mother, father, and other caregivers were 29.8 years (SD±4.7), 35.9 years (SD±6.0), and 33. ±6 years (SD±25.3), respectively. Of the mothers, 76.4% were under 25 years old, and of the fathers, 55.3% were over 35 years. But only 55% of the fathers and 44% of the mothers had formal education. 63.4% of the participants lived in rural area and the majority of them were living as farmers. The bulk of them earned less than 2000 Birr per month on average, and almost all of Care takers were married. The majority of DAMA signatories were fathers, followed by mothers. Table 2 displays comprehensive details about caregivers.

Table 2: Socio-demographic characteristics of caretakers, TASH, 2021

Variable		**number**	**percent**
Maternal occupation	Farmer	48	39.0%
	Gov't employee	25	20.3%
	Private business	16	13.0%
	Unemployed	34	27.6%
Paternal occupation	Farmer	51	41.4%
	Gov't employee	25	20.3%
	Private business	44	35.8%
	Unemployed	3	2.4%
Mothers educational level	Illiterate	56	45.5%
	Primary	22	17.9%
	Secondary	22	17.9%
	College& above	23	18.7%
Paternal educational level	Illiterate	45	36.6%
	Primary	27	22%
	Secondary	26	21%
	College& above	25	20.3%
Care-taker marital status	Single	3	2.4%
	Married	114	92.7%
	Widowed	5	4.1%
	Divorced	1	0.8%
Caretaker living place	Urban	45	36.6%
	Rural	78	63.4%
Family monthly income	<600birr	21	17.1%
	6001-1650birr	32	26.0%
	1651-3200birr	33	26.8%
	3201-5250birr	8	6.5%
	>5250birr	29	23.6%

DAMA characteristics

The median hospital stay before DAMA was 7 days (IQR=13 days). Eighty-one percent of the caretakers signed DAMA before leaving the hospital (figure 2).

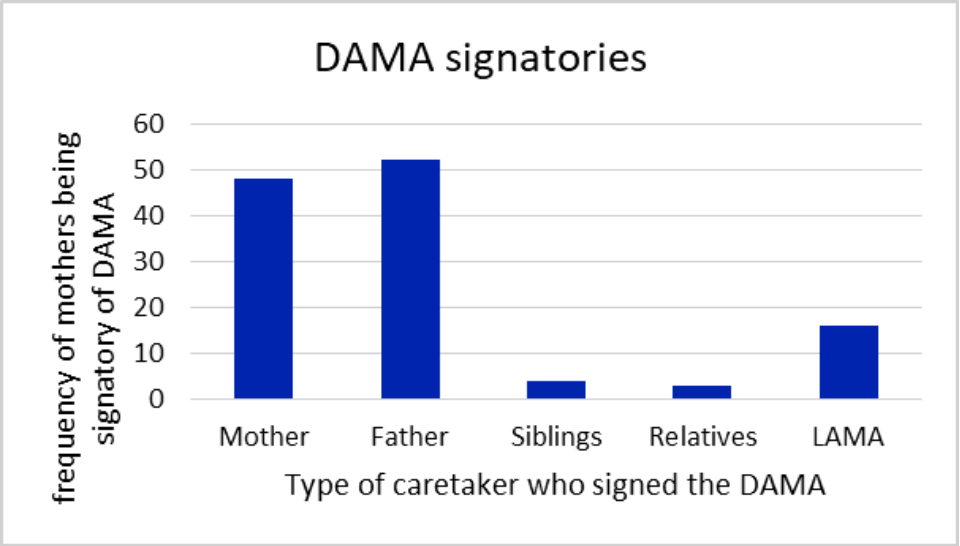

Figure 2. Caretaker type signed the DAMA form, TASH 2021

Nearly two-thirds of cases left the hospital during working hours and during daytime. DAMA occurred in the weekends in 31.7%, and the rest during holidays (4.8%). One-third of DAMA occurred at night time, with two-thirds (75.6%) observed during Bega (sunny season).

Hemato-oncologic problems, infections and newborn problems were common. The type of clinical diagnosis is displayed in figure 3.

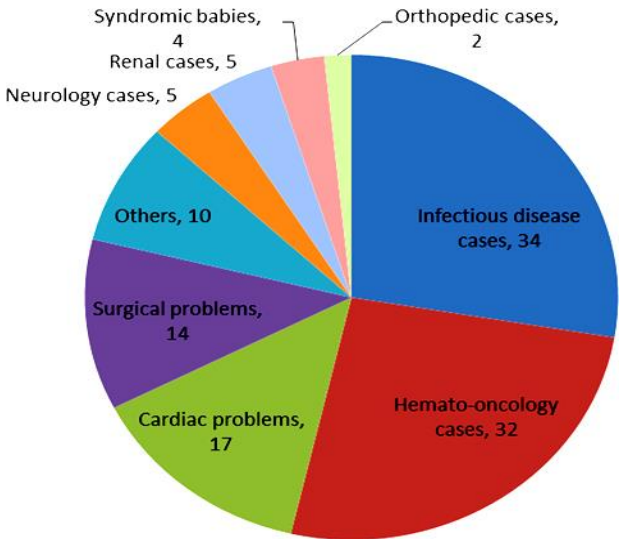

Figure 3: Main admission diagnosis of cases of DAMA, TASH 2021.

The reasons that led caretakers to DAMA are shown in Figure 3. Lack of clinical improvement (52.0%) and financial constraints (27.6%) were the main reasons for deciding DAMA (figure 4).

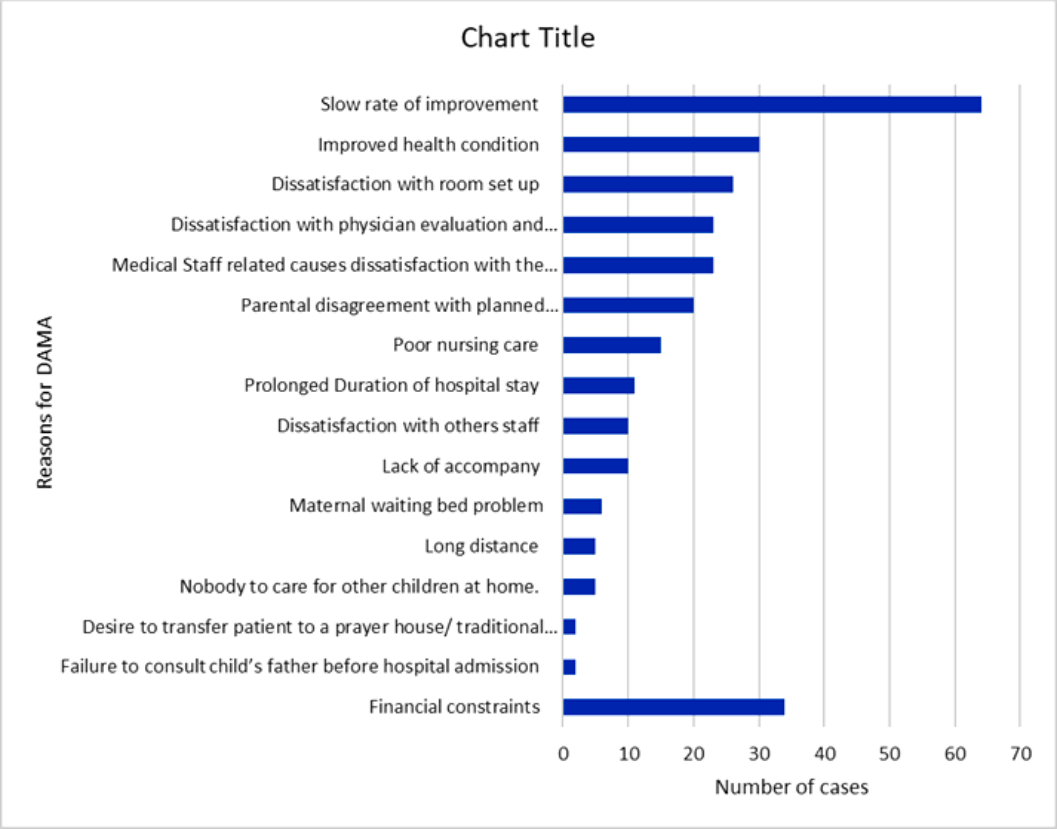

Figure 4: Reasons that led Caretakers to DAMA their sick kids, TASH 2021.

Most of the cases were reported from the pediatric emergency and Neonatal wards. Cases that resulted in death, re-admission, improved health, and follow-up in other places occurred in 32), 11.4%, 25.2%, and 30% respectively. The determinants of DAMA are shown in Table 3.

Table 3. Determinants of DAM outcome, TAS H, 2021

Variable	Category	DAMA outcome		Chai square	P-value	COR (95% CI)	AOR (95%CI)
		Died	Other				
Financial constraints	Yes	6	28	3.5	0.06	0.4 (0.14-1.07)	1.00(0.37-2,71)
	No	31	58			1	1
Fast improving	Yes	30	29	23.2	<0.001	0.1(0.04-0.30)	6.90(2.19-21,78)
	No	7	57			1	1
Dissatisfaction with physician	Yes	4	19	2.1	0.14	0.4(0.13-1.35)	1.6(0.46-5.8)
	No	33	67			1	1
Dissatisfaction with nursing care	Yes	5	10	0.08	0.076	1.2(0.37-3.8)	1.0(0.22-4.4)
	No	32	76			1	1
Dissatisfaction with the ward diet	Yes	4	6	0.5	0.47	1.6(0.42-6.1)	0.4(280- 6.102)
	No	33	80			1	1
Monthly income	≥5000birr	11	19	0.8	0.36	1.5(0.6-3.6)	2.8(0.8-9.6)
	<5000birr	26	67			1	1
Age(months)	0-12	28	37	0.001	10.702	4.0(1.7-9.6)	1.3(0.48-3.3)
	≥13	9	48			1	1
Time of DAMA	Weekdays	22	56	1.3	0.55	0.8(0.4-1.7)	1.7(0.6-4.5)
	Weekend & holidays	15	30			1	1

Discussion

Over the two-year period, DAMA prevalence was 1.42% in the current study. Death and readmission were 32% and 11.4% in discharged children. Lack of clinical improvement is the frequent cause of DAMA. Infants and neonates are commonly affected. Hemato-oncologic cases and neonates were commonly affected.

The result was compared with different reports. for eg- DAMA reported from a pediatric center in Iran at 5.3% while in Singapore's Alexandra Hospital, at 2%(5). In Nigeria, DAMA rates were ranging from 1.5% to 5.7% (6, 7, 15) among different pediatric centers. A variance over time was also observed in the Zamboanga City Medical Center's Department of Pediatrics. DAMA was recorded at 2.1% in 2005 but rose to 4.6% for the first six months of 2010 (7). The prevalence of DAMA was low compared to most reported cases even among the developing countries (16, 17). Given the above observation, DAMA in our setting may not be beyond control if specific measures are taken. An alternative explanation for the low prevalence may be a lack of proper documentation. Further study is required to verify such speculation.

Shahla Roodpeyma et al reported that 79.4% of the DAMA cases were aged ≤12 months and the mean duration of hospitalization was

4±3.3 days while our finding showed the same age distribution but with a bimodal pattern. They reported neonatal problems and infections as a common reason for admissions. Oncologic problems were not a common cause of admissions in their report. The difference may be because our center serves as an oncology referral center. In contrast to our finding, financial constraints were the least cause of DAMA in their report (18). A study conducted in Singapore at a general hospital showed that infants and neonates accounted for over half of the cases and the common reason for DAMA is the inconvenience of having a child admitted in the hospital and the preference of being treated by the general practitioner. Financial constraint was the least cause of DAMA in their report. Maybe this is owing to that Singapore is economically in a better position than we are (17). In our study, over 63% of the parents who signed DAMA were living in rural areas. A study from Ebonyi State University Teaching Hospital, Abakaliki in southeastern Nigeria, reported a similar finding. They reported that financial constraint is the commonest cause of DAMA followed by hopelessness of the disease condition. In Australia where the patient is not required to pay for their hospital stay due to a government-funded hospital service, length of hospital stay was not predictive of DAMA. However, in low socio-economic communities, because of financial burden, the duration of hospital stay may be predictive of DAMA (14).

Neonates accounted for the larger proportion of the reported cases similar to our report but they reported children with surgical conditions as the most vulnerable groups in their report (16). Sex and age distribution were compared with the report of A N Onyiriuka from Benin. There, they reported female sex predominance. Male sex is commonly observed in the current study as in most other reports. The interpretation requires further study. They reported the common age to be affected is the second and third year of age instead of infancy and neonatal age in contrary to our findings.

Similar to our findings, they reported that nearly half of the parents (51.7%) did not have formal education or did not comp lete primary school (19).

In this study, we observed higher DAMA prevalence in the neonatal ward. It was reported that intense stress and psychological sufferings experienced by delivering mothers postnatally may contribute to a decision to discharge at own risk. Further study is required to determine this assumption (20).

In the current report, the DAMA signature is done more frequently by the fathers. To explain this observation, evidence-based conclusions are required, however, in many LAMI nations, fathers occupy a dominating role and make many family-related decisions because men provide the majority of the family income and are frequently older than their spouses (21). Death was observed in our report in those cases who showed fast clinical response before DAMA was decided. The fast clinical response was interrupted by the DAMA might

have caused clinical deterioration and death in the affected cases. Such finding has to be substantiated by similar findings elsewhere if one has to accept the result.

Limitations of the study: A retrospective cross-sectional survey is subject to recall bias. In addition, cases might have been missed because of incomplete documentation. Because we have taken all death cases we didn't know whether the cause of death is related to the DAMA or not.

Conclusions: DAMA in the Pediatric wards of Tikur-Anbessa Specialized Hospital was similar to the reported data elsewhere. However, death was very high which could be due to insufficient follow-up after DAMA.

Declarations

Ethical consideration

Departmental research and publication committee (DRPC) approval was obtained and a letter was written to each ward to have permission for data collection. Oral consent was obtained from caregivers before the telephone interview.

Authors contribution

HF was involved in writing the research proposal, get approval from DRPC, Collecting the data, and did the writeup. TM was involved in the inception of the research question and reviewed the proposal and the writeup. TM is the corresponding author.

Competing interests

The authors did not have any conflict of interest on the manuscript.

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ORIGINAL ARTICLE

COMPETENCE OF PEDIATRIC RESIDENTS AND NURSES IN METERED-DOSE INHALER TECHNIQUES FOR ASTHMA PATIENTS AT TIKUR ANBESSA SPECIALIZED HOSPITAL

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ABSTRACT

***Introduction**: A Metered Dose Inhaler (MDI) is a device containing dissolved or suspended drugs to deliver drugs for pulmonary diseases efficiently. However, studies in Ethiopia show low competency among health professionals. Thus, we assessed the competency of residents and nurses working in a tertiary hospital.*

***Methods**: From June to September 2022, 181 pediatrics and child health department residents and nurses participated in a pretested questionnaire and MDI technique practice. The knowledge score for residents and nurses was determined based on correct answers to questions from 0 to 6 for residents and 0 to 5 for nurses. Good knowledge was defined as a score of 80–100%, moderate knowledge from 60–79%, and poor knowledge from <60% of the total score. The good practice was ≥7 from 11 and all essential steps, while the poor practice was <7 of the total score and skipped essential steps. The chi-square or Fisher exact test was employed to compare groups as appropriate. The 95% confidence interval and a p-value of 0.05 were used to determine statistical significance. .*

***Results**: Of the 181 study participants, 103 (56.9%) were residents. The participants' mean age was 32. MDI technique knowledge was poor for more than half of the residents (52.4%) and 46.4% of the nurses. Twenty-six (14.4%) of participants practiced the MDI technique steps, scoring 7 out of 11 steps. However, only 3.3% practiced the technique correctly. Whereas only 5.8% of residents and 0% of nurses practiced the essential steps of the MDI technique. When using a new inhaler drug, nearly half of the participants (47%) did not assess the patients' practice.*

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***Conclusion**: Healthcare professionals' competency in performing the MDI technique is low. Appropriate training programs are needed to enhance their ability to use inhaled devices and ensure successful drug delivery.*

Keywords: Knowledge, Practice, Asthma, Metered Dose Inhaler, Competency, TASH

Introduction

Asthma is a serious health issue that affects people of all ages. It is estimated that 300 million people are affected worldwide, according to the Global Initiative for Asthma Network (GINA) 2023. Asthma keeps putting an unbearable burden on the healthcare system and society because it results in lost productivity at work and family disruption (especially in the case of pediatric asthma). Around the world, asthma is still a leading cause of mortality. About 96% of deaths in low- and middle-income countries are related to asthma (1). Despite reduced cases in low and middle-income countries, higher deaths are due to healthcare-seeking behavior, limited resources, poor adherence to asthma medications, and limited diagnosis resources. (2, 3).

In Ethiopia, non-communicable diseases caused 711 deaths per 100,000 people, according to the Global Burden of Disease, making them the main cause of age-standardized mortality rates. About 5% of deaths result from chronic respiratory diseases (4). In a study conducted in 2015 in Addis Ababa, Ethiopia, in over 20 primary schools, among children aged 6-7 years old, the prevalence of ever wheezing was found to be 13.1% (5). The prevalence of wheezing was 11.5% in a study of 1-year-old children in a birth cohort from Butajira, Ethiopia, collected from the mother via an interview-administered questionnaire (6). A recent study in Addis Ababa found 31% of children with uncontrolled asthma, with inappropriate inhaler technique significantly affecting their asthma control (7).

In a recent GINA research, children account for 30–40% of all severe asthma exacerbations (2). Inhaled corticosteroid-containing medication lowers the likelihood of exacerbation. Poor inhalation technique is however one modifiable factor that frequently contributes to poor asthma management (8). Utilizing multiple techniques for correct inhaled drug delivery is crucial for asthma control. MDIs are essential for effective drug administration for pulmonary diseases, consisting of a canister, metering valve, and actuator mouthpiece. They provide dissolved or suspended medications for accurate dosing and aerosol conveyance (9).

A systematic review of 55 studies published between 1975 and 2014 found that only 15.5% of Health Care Professionals (HCPs') inhaler proficiency scores were considered accurate. The following errors were made most frequently when using MDIs: failing to fully exhale before inhaling (75%), being uncoordinated (64%), and holding the breath after inhaling (63%) (10). A study demonstrated practical skills and knowledge among

physicians and nurses in two pediatric emergency settings in Switzerland, with 49% mastering it and 34% almost perfecting it. Nurses demonstrated the technique better than doctors, but common errors included forgetting to shake the MDI between puffs and placing the patient incorrectly (11). Evaluation of Nigerian pediatric residents' knowledge of the metered MDI device technique and usage shows that of the participants, only 14.5% had a good knowledge score (12). In Ethiopia, a significant proportion of patients with asthma suffer from poor control of asthma symptoms. Improper inhalant technique is identified as a risk factor for poor asthma control (13-15). Health professionals in Ethiopia are demonstrating inadequate competency in inhalant technique, as evidenced by studies on drug dispensers, indicating a lack of knowledge in proper inhalation device usage. (16, 17).

Numerous studies have found that Health Care Workers (HCWs) have poor MDI techniques (18-22). This study aimed to evaluate the competency and techniques of pediatric residents and nurses at Tikur Anbessa Specialized Hospital (TASH) in the proper administration of inhaled medications, as their successful use requires both practical skills and theoretical knowledge for optimal pulmonary disease management.

Method and materials

Study area and period

The study was conducted at TASH, Ethiopia's largest referral and teaching hospital, from June 1 to September 30, 2022. The hospital, located in Addis Ababa, offers undergraduate and postgraduate teaching services, and treats around 400,000 patients annually having over 760 beds. With 123 pediatric residents and 92 pediatric staff nurses, the hospital provides care in various wards, including emergency, Pediatric Intensive Care Unit (PICU), chest clinic, and wards. Chest clinics, pediatrics wards, and emergencies were the study settings where MDI techniques were frequently used.

Study design

A hospital-based, cross-sectional study was conducted.

Source and study Population

- Source population

All pediatrics residents and nurses working at the Department of Pediatrics and Child Health in Tikur Anbessa Specialized Hospital.

- Study population

All enrolled pediatrics residents, first to final year, and all nurses who are working at the chest clinic, emergency ward, pediatric ICU, and pediatric wards.

Inclusion and exclusion criteria

- Inclusion criteria

All pediatric residents and nurses who were willing to participate in this study and who had given written consent were included in the study.

- Exclusion criteria

Residents who were on study leave and nurses on annual leave.

Sample size determination

Using the single population proportion

calculation, the sample size was calculated with a 95% confidence level, a 5% margin of error, and a 50% p-value (because no previous studies had been conducted). The sample size was determined to be 384. There were a total of 215 nurses and residents. The population reduction calculation was used because there were fewer than 10,000. With a 10% non-response rate added to the calculated minimum sample size of 138, a total sample size of 152 was calculated. However, every nurse and resident who met the requirements for inclusion was included. Hence, 181 was the sample size used.

Sampling technique and procedure

There were 215 residents and nurses. All residents and nurses who met the inclusion criteria were included in our study. We ended up with 181 samples.

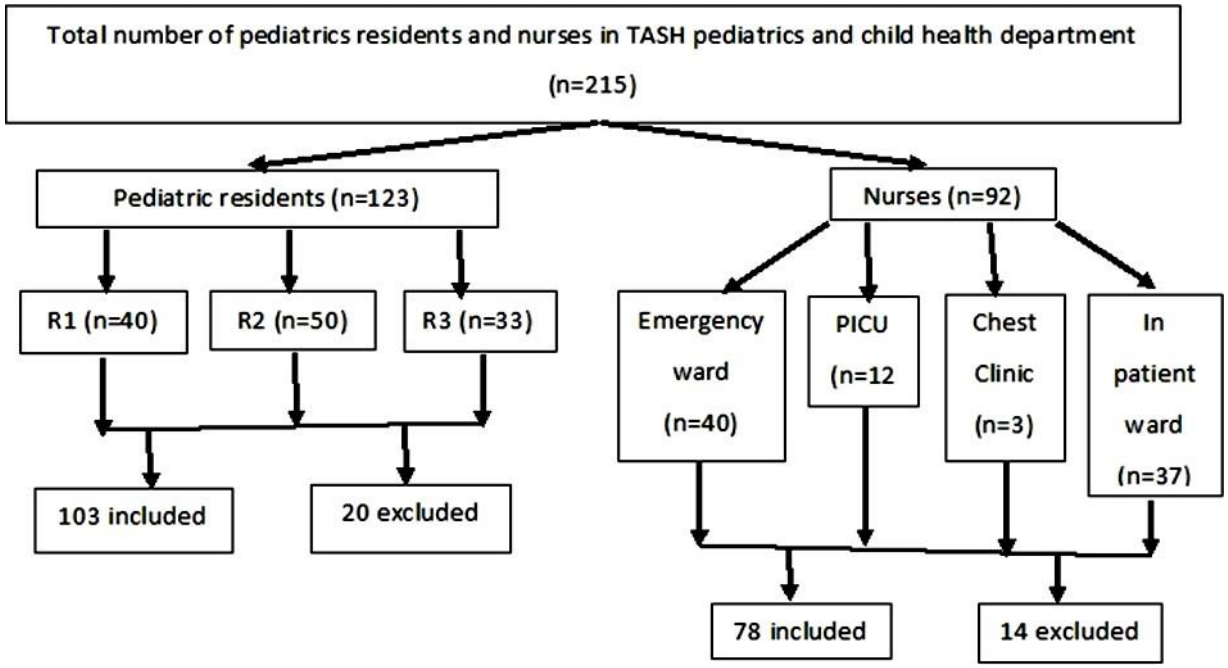

Figure 1: Flow diagram of study participant selection illustrating participants.

Study variables

- **Dependent variable**

  Competency of health professionals towards MDI techniques.

- **Independent variables**

  Socio-demographic characteristics (Age, sex, self-asthma diagnosis)

  Professional characteristics (year of experience, level of education, years in Residency, and nurses

  Training on MDI, source of information for MDI use

  Attachment to the chest clinic

  Knowledge

  Practice

Operational definitions

Based on the correct answers to the 6 and 5 knowledge questions, respectively, the knowledge score, ranging from 0 to 6 for residents and 0 to 5 for nurses, was determined

using Bloom's cut-off point, and the practice score, which ranged from 0 to 11 classified according to NAEPP (National Asthma Education and Prevention Program of America) (23).

- Good knowledge = 80-100% of the total score
- Moderate knowledge= 60-79% of the total score
- Poor knowledge = <60% of the total score
- Good demonstration = ≥7 from 11 and all essential steps step 1,2,5,6,7,8
- Poor demonstration = < 7 of the total score and if essential steps
- Competence: - is the knowledge that enables a person to practice a concept (MDI techniques).

Data collection procedures, and quality assurance

The data was obtained using a self-administered questionnaire written in English. The evaluation tool was adapted from the National Asthma Education and Prevention Programs of America (NAEPP) step criteria for administering a metered dose inhaler to score the subjects' practice level in using MDIs (23). Study subjects were to be given an MDI device after they completed the knowledge and were asked to practice the technique. The healthcare professionals were asked to practice the technique as if they were telling it to a patient-facing individual.

Assessments and scoring were done by trained health professionals while the subjects were demonstrating. Data collectors were pharmacy professionals who received two days of training on MDI technique demonstrations. They simply observed the technique and ticked off a checklist while offering a sample of puff. Scores were assigned as "1" for correctly demonstrated steps and "0" for steps that were incorrectly demonstrated or skipped. Inhalational technique adequacy was demonstrated by their ability to demonstrate all the essential steps (Steps 1, 2, 5, 6, 7, and 8), a total score of 7 or more, and those who did not demonstrate all the essential steps correctly and scored less than 7 were considered to have poor inhalational technique practice.

For the knowledge portion, residents and nurses were assessed separately. It had 6 questions for residents and 5 questions for nurses, measured by the Bloom scale. Those who scored less than 60% were considered poor, 60% to 79% were considered moderate, and above 80% were considered good.

Data collectors and supervisors underwent two -day training on basic data collection skills, with structured checklists tested on 5% of the sample. Pre-test problems were corrected, and each question was properly coded. The principal investigator provided continuous supervision during both pre-test and data collection periods, and data was checked for consistency and completeness daily.

Data management and analysis

The collected data on Open Data Kit (ODK) version 1.25.2 was exported directly into Statistical Package for Social Science (SPSS) version 25.0 for statistical analysis after each

completed form was checked for completeness. Continuous variables were reported as the mean with the standard deviation (SD), whereas categorical variables were presented as frequency and percentages. The Chi-square or Fisher exact test for expected frequency less than 5 was used to compare groups for categorical variables. Statistical significance was established using a p-value of <0.05 and a 95% confidence interval. Text and tables were used to present the findings.

Results

Demographic data, MDI, and work experience

The study involved 181 participants, with 114 (63.0%) being male and a mean age of 31.8 ± 3.5 years. Over half were residents, with 44 (42.7%) being year II residents and 38 (48.7%) being BSc nurses. Nearly one-third had a service year of 5 years or more. Only 11.6% received MDI technique training, with over half learning from books and articles. 53% of participants assessed patients' MDI technique when using new inhaler drugs or on visits, while 85 (47%) didn't. Nearly 25% of participants said it was easy and patients could do it. (Table 1)

Table 1: Baseline characteristics of pediatric residents and nurses at TASH.

Variables	**Categories**	**Frequency (%)**
Age	20 to 29 years	49 (27.1)
	30 to 39 years	125 (69.1)
	40 to 50 years	7 (3.9)
Sex	Male	114 (63.0)
	Female	67 (37.0)
Profession	I. Resident	103 (56.9)
	A. Year 1	34 (33.0)
	B. Year 2	44 (42.7)
	C. Year 3	25 (24.3)
	II. Nurse	78 (43.1)
	A. Bsc	38 (48.7)
	B. Diploma	25 (32.1)
	D. Masters	15 (19.2)
Year of experience	< 5 years	118 (65.2)
	≥ 5 years	63 (34.8)
Have asthma	Yes	4 (2.2)
	No	177 (97.8)
Assigned to the chest clinic	Yes	51 (28.2)
	No	130 (71.8)
Training on MDI technique	Yes	21 (11.6)
	no	160 (88.4)
Acquired the skill (Multiple responses)	Scientific societies	11 (3.8)
	Workshops organized by pharmaceutical industries	62 (21.5)
	Reading articles or books	100 (55.2)
	Reading the leaflet	76 (26.5)
	Directly from personal	39 (13.5)
Did you assess the patients' skills when they used the new inhaler drug?	Yes	96 (53)
	No	85 (47)
If you don't asses' what was your reason	I don't know myself	7 (3.9)
	It's not my job	8 (4.4)
	I guess it's easy they can do it	45 (24.9)
	Unknown	25 (13.8)

Knowledge towards MDI

The study found that over half of residents (52.4%) and nurses (46.4%) had poor knowledge of the MDI technique. The profession had a significant effect on knowledge levels (P = 0.002). A significant proportion of nurses had good knowledge (11.5% versus 0% compared to residents), while a significant proportion of residents had moderate knowledge (47.6% versus 41.0% compared to nurses). (Table 2)

Table 2: Chi-square comparison of MDI technique knowledge level in TASH pediatrics residents and nurses

Variables		**Knowledge level**			**P value**
		Poor	Moderate	Good	
Profession	Residents	54(52.4%)	49(47.6%)	0(0%)	0.002
	Nurses	37(47.4%)	32(41.0%)	9(11.5%)	
Year of Residency (n=103)	Year 1	22(64.7%)	12(35.3%)	0(0%)	0.093
	Year 2	23(52.3%)	21(47.7%)	0(0%)	
	Year 3	9(36%)	16(64%)	0(0%)	
Nurse (n=78)	BSC	19(50%)	16(42.1%)	3(7.9%)	0.247
	Diploma	14(56%)	7(28%)	4(16%)	
	Masters	4(26.7%)	9(60%)	2(13.3%)	

Practice level

The study found that 14.4% of participants practiced the MDI technique steps, scoring 7 out of 11 steps. However, only 3.3% practiced the technique correctly. The mean ± SD practice score for all participants was 4.09 ±1.8, while the mean scores for residents and nurses in using the proper inhaler technique were 3.37±0.8 and 2.53 ±0.8, respectively.

Whereas only 5.8% of residents and 0% of nurses practiced the essential steps of the MDI technique, with 91% of participants correctly practicing step 2(removing the cap), 52% wrongly practicing step 7, and 82% skipping step 4 (tilt the head back slightly). (Table 3)

Table 3: Evaluation of each step practice of the MDI technique among pediatric residents and nurses at TASH.

Steps	**Resident**			**Nurses**			**p-value**
	Yes	No	Skipped	Yes	No	Skip	
1* Shake the contents well	71 (68.9%)	1 (1%)	31 (30.1%)	34 (43.6%)	1 (1.3%)	43 (55.1%)	0.001
2 * Remove the cap	96 (93.2%)	3 (2.9%)	4 (3.9%)	68 (87.2%)	0 (0%)	10 (12.8%)	0.023
3 Hold the inhaler up-right	52 (50.5%)	25 (24.3%)	26 (25.2%)	24 (30.8%)	32 (41%)	22 (28.2%)	0.016
4 Tilt the head back slightly	9 (8.7%)	7 (6.8%)	87 (84.5%)	2 (2.6%)	15 (19.2%)	61 (78.2%)	0.014
5 * Breath out slowly	29 (28.2%)	9 (8.7%)	65 (63.1%)	12 (15.4%)	9 (11.5%)	57 (73.1%)	0.115
6 * Open mouth with inhaler 1 to 2 inches away or in the mouth with the lips tightly sealed around it	54 (52.4%)	30 (29.1%)	19 (18.4%)	18 (23.1%)	22 (28.2%)	38 (48.7%)	0
7 * Begin breath in slowly and deeply through the mouth and actuate the canister once	29 (28.2%)	49 (47%)	25 (24.3%)	23 (29.5%)	45 (57.7%)	10 (12.8%)	0.065
8 * Hold breath for 10–20 sec	19 (18.4%)	39 (37.9%)	45 (43.7%)	6 (7.7%)	28 (35.9%)	44 (56.4%)	0.073
9 Exhale & wait one minute before the sec-ond dose	21 (20.4%)	19 (18.4%)	63 (61.2%)	9 (11.5%)	15 (19.2%)	54 (69.2%)	0.267
10 Shake again before the second dose	21 (20.4%)	23 (22.3%)	59 (57.3%)	12 (15.4%)	14 (17.9%)	52 (66.7%)	0.433
11 After use, replace the mouthpiece cover	75 (72.8%)	21 (20.4%)	7 (6.8%)	131 (72.4%)	37 (20.4%)	13 (7.2%)	0.972

A chi-square test result revealed a statistically significant difference in practice level for essential steps based on profession (P <0.05). A statistically significant proportion of nurses had poor practice (100% versus 94.2%, p = 0.038) compared to residents. (Table 4).

Table 4: Chi-square comparison of MDI technique practice level in TASH pediatric residents and nurses.

Variables		**Practice level (with essential steps)**		
		Poor Demonstration n=175	Good demonstration n=6	P-value
Profession	Residents	97 (94.2)	6 (5.8)	0.038
	Nurses	78 (100.0)	0 (0.0)	
Year of residency	R1	33(97.1%)	1(2.9%)	0.563
	R2	40(90.9%)	4(9.1%)	
	R3	24(96%)	1(4%)	
Nurse	BSC	38(100%)	0 (0.0)	-
	Diploma	25(100%)	0 (0.0)	
	masters	15(100%)	0 (0.0)	
Work experience	< 5 years	115 (97.5)	3 (2.5)	0.421
	≥ 5 years	60 (95.2)	3 (4.8)	
Assign to chest clinic	Yes	47(92.2%)	4(7.8%)	0.054
	No	128(98.5%)	2(1.5%)	
Asthmatic	Yes	3(75%)	1(25%)	0.127
	No	172(97.2%)	5(2.8%)	
Close family with asthma	Yes	24(92.3%)	2(7.7%)	0.207
	No	151(97.4%)	4(2.6%)	
Training	Yes	20(95.2%)	1(4.8%)	0.528
	No	155(96.9%)	5(3.1%)	
Knowledge level of residents	Poor	53(98.1%)	1(1.9%)	0.100
	Moderate	44(89.8%)	5(10.2%)	
Knowledge level of nurses	Poor	37(100%)	0(0%)	-
	Moderate	32(100%)	0(0%)	
	Good	9(100%)	0(0%)	

Discussion

Our study finding shows that the practice towards the steps of MDI technique, of 181 participants, 26 (14.4%) scored ≥7 from 11 steps. However, based on practice on essential steps for the optimum therapeutic value of MDI, only six (3.3%) study participants had adequate practice skills in metered dose inhaling, and no one got all steps right in this study, and none of the nurses practiced all essential steps correctly.

Only six (3.3%) study participants had good practice in MDI technique. This result is comparable to a study conducted among pharmacy professionals in the towns of Mekelle and Gondar, which revealed a good practice of MDI technique, including the essential steps 2 (1.9%) and 3 (4.8%) respectively (16, 17).

However, it is substantially less than the study carried out in Oman, where 22 participants (15%) correctly completed all steps (19). The disparity could be attributed to the different health professions included in the Oman study, such as internists, emergency physicians, and pharmacists; most of them perform well.

It is perhaps not surprising that patients frequently use their device(s) incorrectly since healthcare professionals' understanding of the proper use of these devices is also poor. Only 7% of healthcare professionals, including pharmacists, could accurately demonstrate all the steps in MDI use, according to a recent UK study (24). According to one study, the under-education of patients by healthcare professionals has contributed to poor inhaler use skills among asthmatic patients (25).

Among the steps, more than half of the participants (52%) wrongly practiced step 7 (begin breathing in slowly and deeply through the mouth and actuate the canister once). According to an Iranian study, the high frequency of error was like depressing the canister. A study from Mekelle and Gondar showed step 7 was the most skipped (65% and 77%, respectively) (16, 17). The most skipped step in our step was step 4 (tilt the head back slightly) (82%), which is also similar to Nepal's study (21). In addition, the most correctly performed step was Step 2 (remove the cap), which 164 (91%) of the participants practiced correctly, which is comparable with the study done in Mekelle. (88%) (16).

The majority of participants (55.2%) learned the MDI technique by reading books and articles, while 76 (26.4%) learned it through reading the leaflet. Contrary to a study conducted in Nigeria (26), which revealed that basic knowledge regarding the use of inhalers was acquired through postgraduate studies in 32.7% of cases and medical school in 23.6%, this is most likely because of the Nigerian postgraduate. It's possible that the variation results from different medical school curricula. Another finding of the study was that nearly half of the participants (47%) don't assess patients when they use new inhaler drugs or check during follow-up. From a quarter (24.9%) of them, the most common reason they mentioned was that it was easy, and the patients could do it themselves. This is consistent with the study done in Gauteng province, South Africa. Over 50% of participants did not show MDI technique to patients or check their patients' technique at every hospital-related visit (22); This finding was also similar to that of a recent study that suggested around 25% of patients had not received any verbal instructions for the use of their prescribed inhaler (27). When given, instructions were often hurried, of poor quality, and not reinforced. Only an estimated 11 percent of patients received follow-up assessment and education about their device use techniques. This can lead a patient to have a poor understanding and improper administration of the drug, which can lead to poor control of asthma exacerbations.

Several factors have been cited for inadequate patient education on asthma inhalers. Among these, the most serious concerns were lack of regular periodic assessment of patients' inhaler technique, lack of time for educating patients, and lack of awareness about the importance of patient education. Studies have shown that training that includes instructions and demonstrations of the inhaler technique improves the skills of both patients and providers (28). The very poor inhaler technique observed in our study is most probably due to the lack of any formal training for healthcare providers on the correct use of inhalers.

This study has some limitations, even if it shows a lack of competency in the MDI technique. Even though pediatric residents and nurses may not be comparable in terms of education, work exposure, or experience, they are the key players in managing children with asthma in TASH. The other limitation is that, while collecting data, there was a fear of showing the steps of the techniques for fear of being judged.

The study reveals a low level of competency in performing the MDI technique among healthcare professionals, with most lacking formal training, and identifies the gaps in MDI techniques as they are essential for asthma control. They often don't teach or demonstrate steps during initial orders or follow-up visits. It's recommended that ongoing training programs be implemented to improve their ability to use inhaled devices, ensuring proper inhalation techniques and successful drug delivery, and further research is needed to understand the factors contributing to poor healthcare competency towards MDI techniques.

Declarations

Ethics approval and consent to participate.

Before data collection Ethical approval was obtained from the Department of Pediatrics and Child Health at Addis Ababa University, as well as the College of Health Sciences' institutional review board. Before administering the questionnaire during data collection, signed consent was obtained. The study's objectives and the fact that they had the right to refuse participation were explained to the participants. At every stage of the study, confidentiality was maintained, and the collected data was kept confidential.

Availability of data and materials

All data from this study will be available in this published article.

Competing interests

There were no conflicting interests stated by the authors.

Funding

Addis Ababa University

Authors' contributions

RAK, and GT conception and designed the research. GT performed the research and data collection. GT analyzed data, and interpretation and wrote the paper. EKE wrote the manuscript.

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A CASE REPORT

POST-MUMPS VACCINATION PAROTITIS

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ABSTRACT

Mumps is a common communicable disease among children. It is one of 31 vaccine-preventable diseases at present. The presentation of a two and half year old boy who developed parotitis for the first time three weeks after taking a Mumps vaccine is outlined. Potential adverse events following administration of similar vaccines are discussed. Pediatricians and child health workers in Africa are less experienced in Mumps vaccines due to the absence of Mumps-containing vaccines from their national immunization programs. This description of a child with post-Mumps vaccine parotitis (a comparatively common adverse reaction) serves as learning point on performance and reactions to expect after Mumps-vaccine containing immunizations.

Keywords: Mumps, MMR, Parotitis, Vaccine

Introduction

Mumps is a common childhood viral infection presenting as fever and painful unilateral or bilateral parotid swelling. Parotitis persists for 2 – 7 days. Though mostly self-resolving, potential complications include epididymorchitis (usually in adolescents), meningoencephalitis (notably in adults) and sensorineural hearing loss. Mumps vaccination is practiced in more than 122 countries globally and is lowering the incidence of this communicable disease, especially in the developed world (1).

Experience with Mumps vaccines in Africa is lacking among pediatricians and child health workers due to its absence from the national programs of immunization. This case highlights the presentation and evaluation of post-mumps vaccine adverse effects, notably parotitis.

Case presentation

A two years and six month old boy presented for a routine health check-up. He was asymptomatic with normal vital signs, anthropometric measurements within normal limits for age and normal physical findings. An assessment of vaccines he had received so far showed he had taken a single dose of the measles vaccine at the age of 9 months All other age-appropriate vaccines had been received according to the schedule. After a

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discussion of the available measles vaccine options and the need for a second measles vaccination for his age with his parent, he was given a combined measles-mumps-rubella vaccine (MMR) vaccine. No immediate vaccine-related symptoms were observed.

Nineteen days after his vaccination, the boy started complaining of left ear pain. His mother noted a swelling under his left ear and recorded low grade fever at home (38oC). He had no further symptoms including runny nose, cough, ear pulling or ear discharge. There were no sick contacts. He had an asymptomatic 9 month old sibling. His family had limited excursions outside their home due to the ongoing COVID19 outbreak. His parent reported that he had never experienced similar symptoms in the past and his past medical illness was unremarkable except for a few episodes of treatment for upper respiratory infections and superficial skin fungal infections. On physical examination, his temperature was 37.5oC. He had a left sided parotid gland swelling with a slight anterior displacement of his left ear. The rest of his examination including otoscope examination were normal. In keeping with the typical incubation period of mumps (2 – 3 weeks), a likely diagnosis of a post-MMR vaccination parotitis was made. His parent was counseled on the course of his illness and encouraged to administer symptomatic treatment with adequate hydration. His symptoms and physical findings had resolved upon evaluation one week later.

Discussion

Currently available mumps vaccine containing vaccines are the MMR (Measles, Mumps, and Rubella) and MMRV (Measles, Mumps, Rubella, and Varicella) vaccines. The mumps virus strains present in these vaccines are varied: commonly the Jeryl Lynn, Urabe and Leningrad-3 strains (2). Mumps vaccines have efficacies of 70% (Urabe) to 82% (Jeryl Lynn) after single doses and approximately 10% more with two doses. Benefits are targeted towards preventing or causing only subclinical Mumps infections. In outbreak settings vaccine effectiveness is lower (3).

Minor post-MMR vaccination adverse reactions include low grade fever and pain at injection site. Parotitis was reported in 1.8% of more than 14,000 Iranian children following receipt of MMR, occurring 18 times more frequently than fever or convulsions (4). Most Post-Mumps vaccine parotitis occur within 10 – 14 days following vaccination and are usually thought to be subclinical and non-communicable compared to natural infection (5). In parts of the world where non-Jeryl Lynn strain containing vaccine are administered, higher rates of children experiencing vaccine-induced aseptic meningitis have been reported, though the overall incidence is rare in 1 per 2000 recipients (6).

Application of Jeryl Lynn vaccines may cause a higher rate of febrile seizures. This has been observed when the first vaccine had been

applied at the age of 16 month or later (3). In contrast to the initial dose of vaccine, administration of the second MMRV dose is not associated with a higher number of febrile seizures (3,7). Within six weeks after being inoculated with MMR vaccine there is an increased risk to develop idiopathic thrombocytopenic purpura (ITP). The risk was estimated at 1 in 40,000 MMR vaccine recipients 8,9).

This description of a child with a post-Mumps vaccine parotitis serves to remind adverse events to expect after Mumps-vaccine containing immunizations.

Declarations

Ethical consideration

Ethical approval is not required as patient data has been anonymized.

Conflicts of interest

The author declares the absence of any conflicts of interest.

Author contribution

TA is responsible for the project administration, conception and design of the study, data curation, data analysis, manuscript preparation and revision.

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BRIEF COMMUNICATION

POLICY, HEALTH FACILITY AND COMMUNITY IMPLICATIONS OF THE FINDINGS OF THE STUDY OF ILLNESSES IN PRETERM (SIP PROJECT): SUMMARY RECOMMENDATIONS FROM A DISSEMINATION WORKSHOP

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ABSTRACT

The Study of Illness in Preterm (SIP) was designed in 2015 to identify the major causes of morbidity and mortality in preterm babies. Preterm complications are the commonest cause of neonatal mortality. The SIP study investigators in collaboration with Federal Ministry of Health-Ethiopia (FMOH) organized a dissemination workshop during the world prematurity day between Nov 17-18, 2021.

The objective of the SIP dissemination workshop was to conduct a policy dialogue with policy makers and program implementers to support policy and practice changes. Five publications that have immediate policy and practice implications were selected and discussed in a dissemination workshop. These were hypothermia, preterm nutrition, bacterial isolates and antimicrobial resistance (AMR), antenatal corticosteroid utilization and respiratory distress syndrome (RDS).

For each topic, the workshop assessed and documented the magnitude of the burden of disease, operationally feasible recommendations at policy, facility and community levels and potential implementation research ideas that could help facilitate rapid scale up of interventions.

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Introduction

Every year, an estimated 15 million infants are born preterm, and this number will continue to increase unless and until appropriate measures are taken immediately [1]. Preterm birth is the leading cause of under-five mortality, especially neonatal mortality. In 2021, 2.3 million newborn deaths occurred globally, accounting for 47% of all under-five deaths. Just over a third of these infants died because of preterm complications [2]. The World Health Organisation (WHO)estimates that prematurity is the leading cause of under-five mortality with nearly 18 deaths per 1000 live births [3]. In September 2015, the international community has launched a global Sustainable Development Goal (SDG). One of the health targets of the SDG is target 3.2.2, and it is committed to reducing neonatal mortality rate (NMR) to 12 per 1000 livebirths by 2030 [4]. However, the neonatal mortality rate in Ethiopia has not been declining and in fact, the 2019 mini-DHS shows, the NMR standing at 33 per 1000 live births [5].

The Study of Illness in Preterm (SIP) was designed in 2015 in collaboration with the Federal ministry of Health of Ethiopia (FMOH) and other development partners primarily to identify the major causes of death in preterm babies. The SIP study investigators in collaboration with FMOH and development partners organized a dissemination workshop during the world prematurity day between Nov 17-18, 2021.The objective of the SIP study dissemination workshop was to conduct a policy dialogue with policy makers and program implementers to support necessary policy and practice changes based on the findings of the study. In consultation with the MCH directorate of the Federal MOH, 5 SIP publications that have immediate policy and practice implications were selected and discussed in the dissemination workshop: Hypothermia, preterm nutrition, bacterial isolates and antimicrobial resistance (AMR), antenatal corticosteroid utilization, respiratory distress syndrome (RDS). Under each of these topics, a small group was formed to discuss the following issues:

- Identify and discuss local experiences in addressing the problem - regional or national.
- Identify barriers to scaling up available interventions, both the demand and supply side bottlenecks.
- Recommend solutions; innovations, tools and technologies that could help scale up interventions that are lagging behind.
- Identify an enabling environment such as policy/ guidelines, financial support etc.
- Provide recommendations to be taken forward such as priority bundles of care and potential implementation research ideas.

The workshop involved regional health bureaus including the maternal and newborn focal persons and implementing partners. The summary of the outputs of the workshop are summarized below for each topic.

Respiratory Distress Syndrome (RDS)

One of the objectives of the SIP project was to determine the major causes of preterm mortality. The prospective multi-centre clinical study documented detailed maternal/obstetric history, clinical observations, x-rays, ultrasound, and microbiological data using standardized protocols without interfering in the routine management of the preterm infants. Primary and contributory causes of death were determined by an independent team of subject matter experts composed of international and national researchers, and professionals. Final diagnosis was made using a composite clinical criterion such as clinical diagnosis by the treating physician and a post-mortem diagnosis based on the complete body diagnostic Autopsy (CGA) and/or Minimally Invasive Tissue Sampling (MITS).

The workshop identified the following major problems:

- Lack of recognition of RDS as a major newborn health problem despite being responsible for 45% of preterm deaths
- Low coverage of interventions targeting prevention and management of RDS

Hypothermia

The SIP study has revealed that the number one underlying cause of death in preterm babies was hypothermia [6]. What was alarming was that hypothermia was documented even in the tertiary hospitals and among all preterm admissions, more than 85% of preterm babies had hypothermia [6]. With decrease in body temperature from less than 35.50 C to <33 OC at admission, mortality increased with an OR ratio of 1.6 to 7.1 [6].

The workshop has discussed on the following major problems:

High prevalence of hypothermia at all levels of newborn care.

Low coverage of known interventions for thermal control. This is primarily due to poor health care providers behaviour and poor health care seeking behaviour of the communities.

Antenatal corticosteroids (ACS)

The coverage of antenatal steroids in the majority of low- and middle-income countries remain very low as compared to the high-income countries [7]. ACS use has demonstrated a 34% reduction in the incidence of respiratory distress syndrome (RDS), a 46% reduction in intraventricular haemorrhage, and a 31% reduction in neonatal mortality [7, 8]. Trials on administration of ACS use for preterm births in developing countries have shown mixed results. Some results were comparable to those in developed countries [9,10] while other studies did not show a reduction in mortality.

In Ethiopia, the practice is to give 4 doses of antenatal dexamethasone to pregnant women with preterm labour between 24- 34 weeks) [11]. Maternal ACS utilization was assessed among those neonates whose gestational age was below 35 weeks [12]. There was low utilization of antenatal dexamethasone in the 5 tertiary hospitals (37.5%) [12]. The major causes of preterm death were respiratory distress

distress syndrome, sepsis and asphyxia [13].

The workshop identified the following major problems:

- Low coverage at the national and sub-national level
- Most deliveries happening at Primary health care unit (PHC) level
- Lack of clarity on the global standard recommendations and use of ACS

Bacterial isolates, and Antimicrobial Resistance (AMR)

Neonatal sepsis is the third leading cause of neonatal mortality, next to prematurity and birth asphyxia [13]. WHO estimates that one million neonatal deaths per year are due to neonatal sepsis and that 42% of these deaths occur in the 1st week of life. In addition, the survivors of neonatal sepsis are vulnerable to short and long-term neuro-developmental morbidity [14,15].

Neonatal sepsis is a life-threatening condition, and needs immediate empirical antimicrobial therapy to reduce mortality. It is important to choose an antibiotic regimen that covers the most common pathogens. Antimicrobial therapy in most developing countries is mainly empirical due to the relative lack of appropriate laboratory facilities for culture and sensitivity. However, AMR is continuously increasing and therefore challenging the use of empiric antibiotics.

The workshop identified the following major problems**:**

- Alarmingly high prevalence of AMR (more than 80% resistance to recommended antibiotics- ampicillin and gentamicin) [16].
- High prevalence of hospital acquired infections.
- Shortage of recommended second-level antibiotics.

Preterm nutrition

Undernutrition in preterm infants is associated with serious consequences such as increased mortality and long-term neurodevelopmental, metabolic, and growth disorders [17]. Undernutrition largely affects the brain, resulting in poor brain growth and neurodevelopmental delay [18]. Regardless of the degree of prematurity, early postnatal growth (i.e., during hospitalization) has been associated with neurological and cognitive outcomes in infancy and preschool-age [19]. Premature infants are prone to nutrient deficiencies due to inadequate stores, inability to feed adequately, and digest due to immaturity of the digestive system, while optimal nutrition of preterm infants is expected to result in growth similar to that of normally growing foetuses of the same gestational age [20]. The SIP paper explored the nutritional support of preterm infants in the five study hospitals and assessed the association of pattern of feeding and neonatal outcomes [21].

The workshop identified the following major problems:

- High prevalence of extrauterine growth restriction
- Delayed initiation of enteral feeding
- Lack of breast milk fortification guideline

- Lack of parenteral nutrition service for preterm infants
- Lack of breast milk bank

The workshop made the following operationally feasible recommendations based on the study findings as well as results of the discussions in the workshop:

On policy level interventions

- Review and revise current guideline and develop national protocols.
- Initiate integrated refresher training, provide necessary supplies and conduct supportive supervision regularly.
- Policy guidance for task shifting to allow PHCs to initiate ACS.
- Review and revise national guideline on infection prevention and control.
- Strengthen surveillance on AMR at national and sub-national levels sentinel sites.
- Avail the necessary inputs and supplies that are necessary to prevent and manage RDS at all levels including supply of blended oxygen and CPAP equipment.
- Establish breast milk bank at national and regional levels

On facility readiness (actions at the facility level)

- Increase the number of trained staff on management of the 5 problems by providing regular refresher trainings at all levels.
- Identify essential supplies for thermal control and ensure regular availability of dexamethasone, first line and second line antibiotics for sepsis, Infection prevention controls/IPC (water supply, soap, disinfectants etc) and oxygen concentrator, nasal prongs, blended oxygen supply, pulse oximeters, apnoea monitors, Continuous positive airway pressure (CPAP) machines. Ensure regular supply of breast milk fortification, parenteral nutrition supplies, preterm feeding equipment and supplies etc.

On demand generation (improve health service utilization)

- Provide refresher training to Health Extension Workers (HEWs).
- Awareness creation at the community level on prevention and management of all the 5 problems.
- Improve access to Antenatal Care (ANC) and service for preterm deliveries through task shifting

Potential future implementation research ideas:

- Continuous KMC (immediate KMC followed by community KMC)
- Introduction of new tool and technology for thermal control such as a thermoswatch
- Test for possible task shifting: Initiation of ACS at PHC level (potential for Randomized clinical trials/RCT)
- Feasibility of use of caffeine to prevent preterm apnoea
- Develop and test new screening tool for neonatal sepsis at the hospital level (such as using serial micro-ESR, C-reactive protein, other acute-phase reactants)

- Introduction of non-invasive (aerosolized) surfactant at hospital level
- Evaluate the outcome of preterm infants with RDS managed using CPAP
- The use of growth curve in Neonatal Intensive Care Units (NICU), calculating the percentage of weight loss- would it improve the nutritional support?
- Rapid advancement of breastmilk feeding, higher versus standard volume (Randomized clinical trials/RCT)
- Operational feasibility of breast milk fortification in the Ethiopian context

Cross-cutting interventions for all 5 problems

- Expansion and improvement of infrastructure for newborn care (e.g., proximity of NICU to the delivery room, space versus number of babies, different rooms for different purposes).
- Integrated cluster mentorship program for newborns through vertical integration and network of care
- Develop and design for quality assurance and control programs for newborn health care at all levels.
- Introduce digital technology to improve newborn health outcome.
- Design and develop monitoring learning and evaluation framework for newborn health at all levels.
- Strengthen the communication and referral system for newborn health care.

Conclusion:

The workshop assessed and documented the magnitude of the burden of disease, operationally feasible recommendations at policy, facility and community levels and potential implementation research ideas that could help facilitate rapid scale up of interventions.

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Competing interests: There is no competing interest.

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The Ethiopian Journal of Pediatrics and Child Health (EJPCH) is the official Journal of the Ethiopian Pediatrics Society (EPS) and devoted to the advancement and dissemination of knowledge pertaining to the broad field of medicine in Ethiopia and other developing countries. Prospective contributors to the Journal should take note of the instructions of Manuscript preparation and submission to EJPCH, as outlined below.

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- Original Articles (vide infra) on experimental and observational studies with clinical relevance.
- Brief Communications
- Case Series
- Case Reports
- Systematic Review
- Teaching Articles
- Editorial
- Correspondences/Letters to the Editor
- Monographs or set of articles on specific themes appearing in Special Issues of the Journal

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Content and format of articles:

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- 2500 words, excluding Abstracts, References, Figures and Tables. The manuscript of the Article, should appear under the following headings:

  A) Abstract (vide infra)

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D) Results: should present the experimental or observational data in text, tables or figures. The data in Tables and Figures should not be described extensively in the text.

E) Discussion: The first paragraph should provide a summary of key finding that will then be discussed one by one in the paragraphs to follow. The discussion should focus on the interpretation and significance of the Results of the study with comments that compare and describe their relation to the work of others (with references) to the topic. Do not repeat information of Results section in this section.

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    - References should be numbered consecutively in the order in which they are first mentioned in the text and identify references in text, tables, and legends by Arabic numerals in parentheses.
    - Type the references on a separate sheet, double spaced and keyed to the text.
    - Personal communications should be placed NOT in the list of references but in the text in parentheses, giving name, date and place where the information was gathered or the work carried out(e.g. personal communication, Alasebu Berhanu, MD, 1984, Gondar college of Medical Sciences). Unpublished data should also be referred to in the text.
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    - Reference to a book should contain author's or authors' name(s) and initials, title of chapter, names of editors, title of a book, city and name of publisher, year, first and last page numbers.

The following examples demonstrate the acceptable Reference styles.

Articles:

- Gilbert C, Foster A. Childhood blindness in the context of Vision 2020: the right to sight. Bull World Health Org 2001; 79:227-32
- Teklu B. Disease patterns amongst civil servants in Addis Ababa: an analysis of outpatient visits to a Bank employees' clinic. Ethiop. Med J 1980; 18:1-6
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- Laird M, Deen M, Brooks S, et al. Telemedicine diagnosis of Diabetic Retinopathy and Glaucoma by direct ophthalmoscopy (Abstract). Invest Ophthalmol Vis Sci.1996; 37:104-5

Books and chapters from books:

- Henderson JW. Orbital Tumors, 3rd ed. Raven Press New York, 1994
- Clipard JP. Dry Eye disorders. In Albert DM, Jakobiec FA (Eds). Principles and Practice of Ophthalmology. Philadelphia: W.B Saunders: 1994. pp. 257-76

Website:

David K Lynch; laser History: Masers and lasers.

http://home.achilles.net/-jtalbot/history/massers.htmAccessed 19/04/2001

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- Word count; up to 2000 words.
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- Minimum of three and maximum of 20 case reports.
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- Abstracts of up to 200 words; unstructured; (vide supra)
- Statistical statements here are expressed as 5/8 (62.5%)
- Tables and Figures: no more than three
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