Original

The Morbidity and Mortality Pattern of Non-communicable Diseases among Patients in Paediatric Medical Ward of a Tertiary Hospital in Calabar, Nigeria: A 7-Year Review.

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ABSTRACT

Background: Non-communicable diseases (NCDs) are increasingly reported among children in resource poor nations as measures put in place to tackle communicable diseases take root. This study determined the morbidity and mortality pattern of NCDs among patients admitted into the Paediatrics medical ward (PMW) of the University of Calabar Teaching Hospital (UCTH).

Methods: This was a 7-year retrospective descriptive study. Medical records of patients aged two months to 18 years admitted into the PMW from January 2018 to December 2024 were reviewed with their ages, gender, diagnoses and outcome identified. Data was analysed with SPSS version 20 and p -value of <0.05 was statistically significant.

Results: 4210 patients were admitted during the study period, out of which 1,439 (34.2%) had NCDs with male:female ratio of 1.3:1.0, and 46.7% of the participants were under-5 while those aged 15 - 18 years were 10.1%. The commonest causes of admissions were malignancies (28.2 %), haematological disorders (27.2%) and structural heart diseases (11.2%). The relationship between age group and type of disease was statistically significant (p<0.001). One hundred and twenty-eight (8.9%) children died with 58 (45.3%) being under 5. Only 12 (0.8%) discharged against medical advice. The commonest causes of mortality were malignancies and structural heart diseases. Disease type showed a strong association with outcome (p < 0.001).

Conclusion, the high prevalence of NCDs in this study was a cause for concern with significant mortality among under-5. Policies should be directed at providing child-oriented health care services to prevent and reduce NCDs among children.

Key words: Morbidity, mortality, non-communicable disease, children, adolescents.

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INTRODUCTION

Globally, Noncommunicable diseases (NCDs) are on the rise and they are no longer just a problem for developed countries, low-to-middle-income countries are not spared with Nigeria among those affected.[1] This global surge has been attributed to rapidly changing lifestyle.[2] Over the years, developing countries particularly Sub-Saharan African (SSA) region have been battling with a high burden of infectious diseases such as malaria, diarrhoea disease, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) and respiratory tract infections.[3-4] The huge impact and burden of infectious diseases in the sub-region among children created a neglect on NCDs in children as the focus was on tackling infectious diseases.[5] Also, NCDs were thought to be the diseases of adults. This misconception may have contributed greatly to a surge in the incidence of NCDs among children and adolescents in the sub-region.[5]

In Nigeria, NCDs are becoming a major public health issue.WHO reported in 2019, that NCDs accounted for about 27% all mortality with cardiovascular disease and malignancies as the leading causes in Nigeria.[6] In 2021, it was estimated that NCD was responsible for about 30% of all deaths in Nigeria and that 1 in 5 Nigerians risks dying before 70 years of age from NCDs.[7] In 1990, it was estimated that NCDs accounted for about 15% of disease burden in developing countries[2]. In 2002, more than 1.2 million children and adolescents were said to have died from NCDs globally.[8] In 2021, NCDs was said to have accounted for 33.7% of all deaths in SSA and about 67.1% of all mortality globally.[9] Recent estimates indicate that in sub-Saharan Africa, NCDs may be responsible for nearly 60% of all deaths.[6,10]Globally, about 300,000 new cases of sickle cell disease are diagnosed annually and nearly 70% of these cases are in Sub-Saharan Africa (SSA). The World Health Assembly recognized Nigeria as having the largest burden of sickle cell disease worldwide.[2,4] This trend may worsen if no result-oriented policies and strategies are implemented to address the problem. The rising trend in incidence of NCDs in developing countries has been attributed to several socio-economic factors including dietary habits, westernization of lifestyle and improved socio-economic status and neglect.[11, 12,] In Nigeria, childhood NCD has not received priority attention in health care delivery and very little emphasis has been placed on the prevention of NCD in children.[13]

The United Nations' General Assembly in 2011 made a declaration on the need to prevent and control NCDs among children and adolescents.[14] World Health Organization (WHO), advocated that health care institutes initiates strategies to help people with NCDs, reduce the morbidity and mortality.[10,15] It has been estimated that people in developing countries experience about 90% of the world's diseases burden and unfortunately have only 10% of the global health care fund.[2] The understanding of the disease pattern and outcome in our environment is imperative in guiding health care providers and policy makers in planning and in resource allocation . This would help in prioritizing the selection and provision of cost effective and efficient health care resources. Thus, efforts must be made to ascertain the true picture and burden of NCDs among Nigerian children and adolescents. Also, understanding the burden of NCDs among children and adolescents is viewed as a global strategy and priority in achieving the sustainable development goals (SDGs) target 3 and 4.[16] Findings from this study will enrich existing literature on NCDs and also provide health care providers and policy makers with information that may help improve practice and also develop strategies to prevent and mitigate the burden of NCDs.

METHODS/MATERIALS

Study Design: This was a retrospective descriptive study.

***Study Setting*:** The department of Paediatrics, UCTH, earlier described by Anah et al[17] has expanded with many consultants and many sub-specialties. Currently the department has six sub-specialty units operating in the medical ward. These units are; Paediatric Cardiology, Neurology, Haemato-oncology, Pulmonology/Infectious diseases, Nutrition/Gastroenterology and Endocrine/nephrology units. Each of these units has 3 to 4 consultants with at least 1 or 2 Professors in each of the units. Subjects recruited for this study were patients who were admitted to the paediatric medical ward (PMW). The PMW has a combined 64 bed space capacity. It is divided into two large divisions of 27 beds each and 3 separate special rooms for protein energy malnutrition (PEM), post-neonatal tetanus and tuberculosis patients respectively. The ward receives patients directly from the Paediatric general out-patient/specialist clinics and transferred patients from the children emergency room.

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The UCTH, serves as a main tertiary health care facility and reference hospital in Cross River State and also receives patients from the neighbouring states including Akwa-Ibom and Abia states as well as from Cameroon.

Materials: Medical records/registers of patients admitted to the PMW from January 2018 to December 2024 served as the source of information. Data retrieved from the medical records included biodata, date of admission, working /final diagnoses, outcome of treatment and date of discharge. The diagnoses were made clinically and confirmed by laboratory investigations. The total number of admissions during the study period was recorded.

Patients were categorized into four groups based on their ages; Group 1; 2 months to 59 months, Group 2; 5 - 9 years, Group 3; 10 - 14 years, Group 4; 15 -18 years. Patients less than 2 months were admitted in the newborn units

The diseases were largely classified based on the organ/system involved.

Inclusion criteria: All patients admitted to the PMW with NCDs with complete medical records/information.

Exclusion criteria: Patients whose information on the ages, gender, diagnoses, and outcome were missing from the medical records or admission register.

Data analysis: Data collected was analyzed using Statistical Package for Social

Sciences (SPSS) for Window (version 20, SPSS Inc. Chicago, IL, USA). Descriptive and

inferential statistics were used where necessary. Comparison of socio-demographic characteristics including age and sex with disease out-come was done using chi-square, independent t-test and analysis of variance (ANOVA) as inferential statistics, alpha level of significance at 95% confidence level set at < 0.05.

Ethical approval: Ethical approval was obtained from the University of Calabar Teaching Hospital Ethics Committee.

RESULTS

Socio-demographic and outcome characteristics of study

A total of 4210 patients were admitted during the study period out of which 1,439 (34.2%) children aged 2 months to 18 years had NCDs. Data on 122 patients were missing; hence they were excluded from the study. Of these, 824 (57.3%) were males**,** while 615 (42.7%) were females giving a male to female ratio of 1.3:1.0. The majority of the participants were under-5 years age group (46.7%)**,** followed by those aged 5–9 years (24.0%)**,** 10–14 years (19.2%)**,** and 15–18 years (10.1%)**.** Regarding treatment outcomes, 1,299 children (90.3%) were discharged alive**,** 12 (0.8%) Discharged against medical advice (DAMA)**,** and 128 children (8.9%) died during hospitalization (Table 1).

Table 1: Socio-demographic and outcome characteristics of study

Variable	Frequency (N=1439)	Percentage
Sex		
Male	824	57.3
Female	615	42.7
Age group/years		
U-5	672	46.7
5-9	346	24.0
10-14	276	19.2
15-18	145	10.1
Outcome		
Discharged	1299	90.3
DAMA	12	0.8
Death	128	8.9

Diseases distribution among study participants

Figure1 shows disease distribution among study participants. Malignancy was the most common condition, affecting 406 children (28.2%)**,** followed by haematologic disorders (27.2%)**.** Other notable conditions included structural heart diseases (11.2%), severe acute malnutrition (9.5%)**,** renal disease (9.1%). Neurologic diseases (5.4%)**,** **g**gastrointestinal (4.4%), endocrine/metabolic (2.5%), and respiratory diseases (2.4%) were less frequently reported.

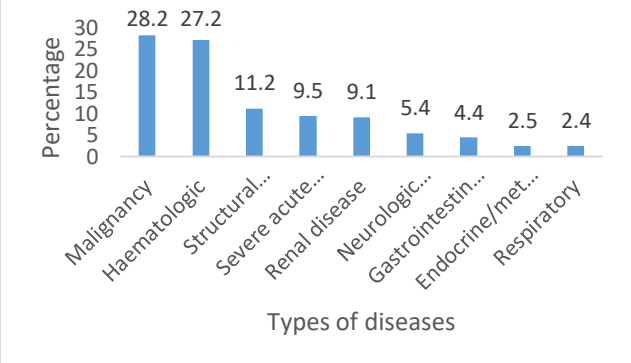

Figure 1: Diseases distribution among study participants

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Relationship between socio-demographic/diseases characteristics and outcome among study participants

Table 2 shows relationship between socio-demographic/diseases characteristics and outcome among study participants. Among males, 739 (89.7%) were discharged, 7(0.8%) discharged against medical advice, and 78 (9.5%) died, while among females, 560 (91.1%) were discharged, 5(0.8%) were discharged against medical advice, and 50(8.1%) died. There was no significant association between sex and outcome (p = 0.675). The U-5 children had a discharge rate of 90.3%, DAMA rate of 1.0%, and death rate of 8.6%. For those aged 5–9 years, 90.2% were discharged, none DAMA, and 9.8% died. Among those aged 10–14 years, 91.3% were discharged, 1.1% DAMA, and 7.6% died, while the 15–18 years group had the lowest discharge rate (88.3%) and the highest death rate (10.3%). The relationship between age group and outcome was not statistically significant (p = 0.234). Disease type showed a strong association with outcome (p < 0.001). Children with haematologic disorders had the highest discharge rate (98.5%) and the lowest death rate (1.5%), with no DAMA. In contrast, those with severe acute malnutrition had a much lower discharge rate (81.8%), the highest DAMA rate (3.6%), and a death rate of 14.6%. Structural heart diseases had a death rate of 31.9%, neurologic diseases had death rates of 18.2%, while respiratory diseases had a DAMA rate of 2.9%. Children with malignancies had a discharge rate of 89.9%, DAMA rate of 1.5%, and death rate of 8.6%.

Table 2: Relationship between socio-demographic/diseases characteristics and outcome among study participants

Variable	Outcome				Test statistics	p-value
	Discharged n=1299	DAMA n=12	Death n=128	Total N=1439		
Sex						
Male	739(89.7)	7(0.8)	78(9.5)	924(100.0)	Chi square, 0.786	0.675
Female	560(91.1)	5(0.8)	50(8.1)	615(100.0)		
Age group/years						
U-5	607(90.3)	7(1.0)	58(8.6)	672(100.0)	LLR,8.060	0.234
5-9	312(90.2)	0(0.0)	34(9.8)	346(100.0)		
10-14	252(91.3)	3(1.1)	21(7.6)	276(100.0)		
15-18	128(88.3)	2(1.4)	15(10.3)	145(100.0)		
Diseases						
Malignancy	365(89.9)	6(1.5)	35(8.6)	406(100.0)	LLR,87.804	<0.001*
Structural heart diseases	136(84.5)	0(0.0)	25(15.5)	161(100.0)		
Severe acute malnutrition	112(81.8)	5(3.6)	20(14.6)	137(100.0)		
Renal diseases	120(91.6)	0(0.0)	11(8.4)	131(100.0)		
Neurologic diseases	63(81.8)	0(0.0)	14(18.2)	77(100.0)		
Gastrointestinal diseases	59(92.2)	0(0.0)	5(7.8)	64(100.0)		
Respiratory diseases	28(80.0)	1(2.9)	6(17.1)	35(100.0)		
Endocrine/metabolic	30(83.3)	0(0.0)	6(16.7)	36(100.0)		
Haematologic	386(98.5)	0(0.0)	6(1.5)	392(100.0)		

*=statistically significant; LLR=likelihood ratio. F

Association between Age groups and Disease among study participants

As shown in Table 3, the distribution of diseases across the different age groups revealed distinct patterns. Malignancies showed an inverse relationship with age, being most frequent in the youngest group (32.3% among children U-5 years) and declining progressively in older children (28.9% in 5–9 years, 21.4% in 10–14 years, and 20.7% in 15–18 years). With a similar trend observed in (SHD). This was highest among the U-5) and declined with age, from 92(57.1) among the U-5 years group to 20(15.5) in the 15-18 years group. In contrast, endocrine/metabolic disorders demonstrated an increasing trend with age, increasing from (0.4% in U-5 years compared to 10.3% in 15–18 years). Severe acute malnutrition was largely confined to the youngest age group (U-5 years), accounting for 20.4% and was absent in all older children,

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underscoring its predominance in infancy and early childhood. Conversely, renal and neurological diseases became more prominent in older children and adolescents, peaking at 18.1% and 6.5% respectively in the 10–14 years group. Haematological disorders, though common in all age groups, peaked among children aged 5–9 years (39.3%) and remained a leading category across ages.

Overall, these variations demonstrate that the pattern of disease occurrence is strongly age-dependent, with early childhood dominated by malignancies, structural heart diseases and malnutrition, while adolescence shows greater prominence of renal, endocrine, and metabolic disorders. The relationship between age group and type of disease was statistically significant (p<0.001), indicating that these observed differences are unlikely due to chance.

Table 3: Association Between Age groups and Disease among study participants

Age Group years)	Diseases-Frequency (Percentages) Malignancy	SHD	SAM	Renal	Neurologic	GIT	Respiratory	Endocrin/Metabolic	Haematological	FET	p-value
U-5	217(32.3)	92(57.1)	7(20.4)	28 (4.2)	32 (4.8)	29 (4.3)	14 (2.1)	3 (0.4)	120(17.9)	376.1	<0.001*
5–9	100(28.9)	28(17.4)	0(0.0)	36 (10.4)	15 (4.3)	10 (2.9)	14 (4.0)	7 (2.0)	136(39.3)		
10–14	59(21.4)	21(15.7)	0(0.0)	50 (18.1)	18 (6.5)	15 (5.4)	6 (2.2)	11 (4.0)	96(34.8)		
15–18	30(20.7)	20(15.5)	0(0.0)	17 (11.7)	12 (8.3)	10 (6.9)	1 (0.7)	15 (10.3)	40(27.6)		

Commonest study participants in each of the major classifications.

As shown in table 4, sickle cell disease was the commonest haematological disorder (39.4%), while ventricular septal defect (VSD) (21.7%) was the commonest structural heart disease (SHD). Among patients with SAM, marasmic kwashiorkor dominated (37.2%). And retinoblastoma was the most common malignancy (29.5%). Among patients with renal disease, nephrotic syndrome (26.7%) was the commonest while diabetic mellitus (33.3%) was the commonest endocrine/metabolic disorder. We also found seizure disorder ((36.4%), peptic ulcer disease (23.4%) and bronchial asthma (28.6%) as the most common conditions among patients with neurologic, GIT and respiratory diseases respectively.

T**able 4:** Commonest NCD among study participants in each of the major classificationion

Major group	Malignancies	Structural heart disease	SAM	Renal Disease	Neurological disease	GIT	Haema disease	Endocrine & Metabolic	Respiratory	FET	P-value
Disease	Retinoblastoma	VSD	MK	Neph Synd	Seizure	PUD	SCD	DM	B/Asthma	372.1	<0.001
No(%)	120(29.5)	35(21.7)	51(37.2)	35(26.7)	28(36.4)	15(23.4)	154(39.4)	12(33.3)	10(28.6)		

FET=Fisher's Exact Test; *=statistically significant.
VSD= Ventricular septal defect, MK= Marasmic kwashiorkor, GIT=Gastrointestinal disease, SCD=Sickle cell disease, PUD= Peptic ulcer disease
DM=Diabetes mellitus, B/Asthma= Bronchial Asthma.

DISCUSSION

The prevalence of NCDs in this study was 34.2%. The commonest NCDs in this study were malignancies, haematolgical disorders, structural heart diseases and severe acute malnutrition. The finding in this study is in tandem with previous reports and similar studies[18-20] in Nigeria. In Port Harcourt, Otaigbe et al[18] reported a prevalence of 19.8%, Emodi et al in Enugu[19] reported a prevalence of 26.9%, while Atimati et al[20] in Benin reported 32.2% of their subjects having NCDs. Although the first two studies reported slightly lower prevalences, this may be accounted for by the facts that these studies were carried out over a decade ago and evidence has shown that children and adolescents in developing countries are facing a growing burden of NCDs. In 2010, according to Global Disease Burden, WHO estimated that NCDs and injuries accounted for 46% of the causes of morbidity and was responsible for 40% of all mortality in Ghana.[21] On the other hand, Yiltok et al[22] in Jos reported a relatively higher prevalence of 40% among their subjects. Their study was done in the children emergency unit, unlike the earlier reported ones that were done in the paediatric medical wards. There is a significant increase in the trend on

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NCDs in children.[6] This is in keeping with earlier projections that NCDs would rise to between 37% to 42% by 2020.[23,24] Sub-Saharan African countries have been battling with communicable diseases. The rising trend in NCDs among children and adolescents presents a double disease burden on the sub-region.[1] For instance, in an earlier study in Calabar by Ineji et al,[25] they reported a high prevalence of cardiovascular risk factors among primary school children. This situation demands policy changes such as institutionalizing preventive measures, early detection as well as appropriate and timely treatment for NCDs. Our findings showed that more males were affected by NCDs than females. This was also reported by previous studies.[18-20] The higher prevalence of NCDs among males than females may be supported by the hypothesis that females have the double protective effect of a transcription factor on chromosome X, which protects against diseases.[26] NCDs were commonest in under 5 children and this is in comparison to studies by Yiltok et al[22] in Jos, Nigeria and Yawson et al[27] in Ghana. The high prevalence of NCDs among the under-fives who are worst plagued by infectious diseases is a double jeopardy. This will add more burden on the already existing morbidity and mortality from communicable diseases. However, in Enugu, Emodi et al[19] reported a higher prevalence among the age group of 5 years to 11 years. In this study, the most common NCDs was malignancies with 28.2%, followed closely by haematologic conditions with 27.2%. Over 175,000 children are diagnosed of malignancy each year worldwide.[28] Unfortunately, 90% of children in developing countries diagnosed of cancers are given a death sentence.[27] This is partly due to late presentation and the huge cost of treatment which is beyond the reach of many families. Cancer is said to be the fourth leading cause of death among children 5 to 14 years in low to middle-income countries. [29] In a systematic review on the burden of noncommunicable disease among adolescents 10-24 years in the European Union, 1990-2019, Global Burden of Diseases Study by Benedetta et al[30] they reported that NCDs accounted for 38.8% mortality with neoplasms responsible for 40% of these mortalities. Similarly, in China, Jing et al[31] reported that NCDs accounted for 37.23% of all mortality among children 10 -24 years of age with neoplasm responsible for the leading level 2 NCDs cause of death. Interestingly, the causes of malignancies are unknown. The reason why retinoblastoma was the commonest malignancy is unclear but many causes could have worked in concert to cause it. Genetic causes have been suggested but this being a retrospective study it was not possible to give it as a reason for its occurrence until a prospective study is done. Furthermore, the high burden of malignancies is an urgent call to early and regular screening as well as creation of awareness among the people. The provision of adequate diagnostic and treatment facilities should also be prioritized. Although, malignancies accounted for the highest cause of NCDs in this study, the mortality associated with malignancies was 8.6%. This was at variance with the 27.3% recorded by Emodi et al [19] in Enugu. The relatively low mortality reported in this study may partly be explained by the fact the low discharge against medical advice (DAMA) may have contributed positively to the outcome. Akshay et al[32] reported that DAMA impacts negatively on hospital outcome of admitted patients. However, many with malignancies may fail to return to hospital due the huge cost and prolonged hospital stay often resorting to seek alternative care at prayer houses and traditional healing homes.[22] Sickle cell disease was the leading haematologic disorder in this study. Nigeria has been tagged by the World Health Assembly as the country with the highest sickle cell disease burden worldwide.[2] Sickle cell disease places a serious burden on its sufferers as well as on the family, accounting for a significant financial burden to families, loss of life and a challenge to the health care system. Fortunately, it is preventable. There is therefore a compelling need for pre-marital screening and counselling as well prenatal screening to reduce the number of persons with sickle cell disease. Structural heart diseases (congenital and acquired heart diseases) were responsible for 11.2% of the NCDs burden causing a mortality of 15.5%. Globally, SHD, particularly CHDs is a problem presenting a huge health care challenge especially in developing countries with inadequate facilities for open heart surgery. Many children diagnosed of CHD can hardly access surgery in Nigeria due to the high financial implication involved. VSDs the commonest SHD in this study are usually treated with either surgery or device closures within the first twelve months of life in developed countries. Acquired heart disease, especially rheumatic heart disease, largely can be prevented by timely implementation of cost-effective primary and secondary measures targeted at prevention and early diagnosis and treatment of streptococcal pharyngitis. Severe acute malnutrition was the third leading cause of NCDs, accounting for 9.5% and responsible for 14.6% of all NCDs related mortality. Nigeria is said to be one of the top 10 countries globally with severe acute malnutrition in children less than 5 years.[24] Malnutrition still remains a major public health issue in sub-Saharan Africa and is said to be responsible for about 45% of all deaths among under five, either directly or remotely.[24] Research has shown that infant and young child under-nutrition increases the risk of developing NCDs.[23] The high rate of SAM is a reflection of the economic burden and hardship created

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in recent times and further compounded by ignorance. There is a need to strengthen community and health systems and fully integrate nutrition into all aspects of the primary health care system and encourage breastfeeding to mitigate this unfortunate trend. These conditions impact negatively both on the parents and families.

Strengths and limitations;
The strength of this study is that it has attempted to unveil the burden and profile of non-communicable disease in our environment.
The limitations of this study are that being a retrospective study and a single centre study, there is the problem of incomplete records which were not used. This can affect the outcome of the study. Also, being a single centre study, the findings from this study may not be a true representation of the burden of non-communicable diseases in our locality. Hence, these findings cannot be generalized.
The implications of the findings of the study;
The implication of increased burden of non-communicable diseases, first implies an increased load on health care delivery system, increased financial burden on individuals and families.
This will negatively affect the overall well-being of the population
On the long run, some NCDs such as hypertension and diabetes in childhood lay the foundation for the perpetuation of NCDs in adulthood

CONCLUSION:
Findings from this study and earlier reports indicate that NCDs is on the increase globally. This increase is a recognized barrier to achieving the targets of the Sustainable Development Goals (SDGs) in reducing child mortality and possibly reverse the gains of the Millennium Development Goals (MDGs). Hence, the health care systems at all levels should be strengthened including the national health insurance scheme to provide child centered care with improved diagnostic and treatment facilities at affordable rates-to mitigate the impact of NCDs.

Declarations
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Conflict of Interest: There are no conflicts of interest with regards to this study.
Authors' contribution: Ineji EO- Conceptualized the work collected data and wrote the manuscript.
Iwasam EA- collected data, analyzed and wrote the manuscript,
Amajor AC- collectd data, read and corrected the manuscript,
Nsa EI-collectd data, read and corrected the manuscript,
Okoi N-collectd data, read and corrected the manuscript,
Ikpeme OI-designed the work, read and corrected the manuscript,
Uzomba-collectd data, read and corrected the manuscript,
Anah MU-designed the work, read, corrected and approved the work.
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