ASSESSMENT OF KNOWLEDGE OF GROWTH MONITORING CHART OF MOTHERS/CAREGIVERS OF UNDER-FIVE CHILDREN ATTENDING UNDER-FIVE CLINIC AT GWAMNA AWAN GENERAL HOSPITAL KAKURI, KADUNA

BY

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A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA
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MARCH, 2014

DECLARATION

This is to declare that this research work on '***Assessment Of Knowledge Of Growth Monitoring Chart Of Mothers/Caregivers Of Under-Five Children Attending Under-Five Clinic At Gwamna Awan General Hospital Kakuri, Kaduna',*** was carried out by me, Dr. Glory Nene Etim-Una under the supervision of Dr. C. L Ejembi of the Department of Community Medicine, Ahmadu Bello University Zaria.

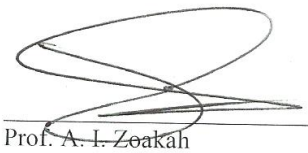
All the original ideas by me are reflected in the work alongside people's previous efforts in the related area, with adequate recognition and declaration of such.

_____ _____

DR. Glory Nene Etim-Una Date

CERTIFICATION

This thesis entitled "**ASSESSMENT OF KNOWLEDGE OF GROWTH MONITORING CHART OF MOTHERS/CAREGIVERS OF UNDER-FIVE CHILDREN ATTENDING UNDER-FIVE CLINIC AT GWAMNA AWAN GENERAL HOSPITAL KAKURI, KADUNA**" by **ETIM-UNA, Nene Glory** meets the regulations governing the award of the degree of Master in Public Health of Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.



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DEDICATION

This work is dedicated to Jesus Christ my Lord and saviour who gave me the exceeding grace and the wisdom to accomplish it.

AKNOWLEDGEMENT

I sincerely appreciate everyone who showed concern and gave psychological support throughout the duration of this course.

I am particularly grateful to my supervisor Dr. C. L. Ejembi, for taking time out of her very busy schedule to guide, counsel, and read through this work, making all necessary corrections. Thank you and God bless you ma.

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ABSTRACT

BACKGROUND

Recent data shows that Nigeria has the 12th (with Niger) highest under- five mortality rate of 143 per 1,000 live births. It is estimated that 60% of under-five deaths in developing countries are attributable to malnutrition and it is a threat to the achievement of the Millennium Development Goal (MDG). In sub-Saharan Africa under nutrition poses a major challenge for child survival and development in the region. In developing countries, knowledge of growth monitoring among mothers/caregivers is generally poor and the extent of practice and attitude to its use among them varies from one community to another. In Nigeria, child mortality and malnutrition rates are far higher in the North East and North West geopolitical zones than in other parts of the country. To address this, it is important for mothers'/caregivers' of under-fives to be aware of early and regular monitoring of growth using growth chart (also known as "road-to-health").

METHODOLOGY

A descriptive cross-sectional study of 360 mothers of under-fives, who presented in Dr Gwamna Awan General Hospital Kakuri, Kaduna in October 2012 was done. The mothers were selected using ballot sampling and interviewed using interviewer-administered pre-tested questionnaires and four (4) growth charts showing different growth curve situations were used: overweight above the upper reference curve, normal ascending within the reference curves, static within the reference curves, and dangerous below the lower reference curve.

The socio-demographic characteristic of respondents: age, educational status, income, parity and number of living children were cross tabulated with the respondents' correct interpretation of the growth monitoring curves. Likert scaling was used to score the mothers'/caregivers' perception of and attitude to the growth monitoring chart and practice. The SPSS statistical software package was used in analysing the data and the results presented in frequency tables, and charts.

The data was analyzed using 1(one) way Analysis of Variance (ANOVA) to investigate the influence of each factor on the mothers' ability to correctly interpret the chart. A 2-way Analysis of Variance (ANOVA) was also carried out to see if all the factors combined together would yield a different influence on the interpretation of the chart. Ap-value of <0.05 was considered as statistically significant.

RESULTS

The mean age of the 360 respondents was 26.03 (SD 1.63). Majority of the respondents were Christians (67.5%) and had had some formal education (73.9%). Few of them had no formal education (23.1%). Those that had heard of and seen the growth chart were 38.1% and 59.0% respectively. Only 11.7% of those that have heard of growth chart got the information from health workers. Correct interpretation of growth charts was poor (30%)

Although 67.8% of the respondents said their children had growth charts, less than half of them (41.1%) had it available as at the time of clinic attendance. About a third (38.1%) of them had been taught on how to weigh their children, 28.9% could actually conduct

weighing. Age p-value=0.005, Educational status p-value=0.02, level of income p-value=0.007,and number of living children p-value=0.0003were the factors that had statistical significance to influence the mothers' ability to interpret the charts.

CONCLUSION

The findings of this study clearly show that mothers'/caregivers' awareness and knowledge of the growth monitoring chart is poor. Their knowledge of the process of monitoring child's growth using the growth chart is poor; they tended to confuse the growth monitoring program with the immunization exercise. More emphasis should be on the involvement of mothers/caregivers to practice growth monitoring, interpretation of growth chart and early interventions when abnormal growth curves are noticed.

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ABBREVIATIONS

ANOVA - - -	Analysis of Variance
ARI - - - -	Acute Respiratory Infection
CBOs - - - -	Community Based Organizations
CIHP - - - -	Centre for Integrated Health Programme
GOBI - - - -	Growth Monitoring, Oral Rehydration, Breast Feeding, Immunization
GC - - - -	Growth Chart
GM - - - -	Growth Monitoring
ICAP - - - -	Integrated Centre for AIDS and Treatment Programme
IMCI - - - -	Integrated Management of Children Illness
KHHP - - - -	Key House Hold Practices
MDG - - - -	Millennium Development Goal
MGRS - - - -	Multi Centre Growth Reference Study
MPH - - - -	Masters in Public Health
NCHS - - - -	National Centre for Health Statistics
NDHS - - - -	Nigerian Demographic and Health Survey
NGOs - - - -	Non Governmental Organizations
ORS - - - -	Oral Rehydration Salt
PHCs - - - -	Primary Health Care Centres
QA - - - -	Quality Assurance
RTH - - - -	Growth Chart – Road-To-Health Growth Chat
SD - - - -	Standard Deviation
SPSS - - - -	Statistical Package for Social Sciences

CHAPTER ONE

INTRODUCTION

1.1 Background Information

In developing countries, knowledge of growth monitoring among mothers/caregivers is generally poor and the extent of practice and attitude to its use among them varies from one community to another.[1] Early possession, regular use, interpretation of the chart (also known as "road-to-health"), and quick communication with health workers to take prompt action is a major barrier to attaining child nutrition and child under-nutrition remains a major public health concern.[1]

Malnutrition, especially under-nutrition continues to be a serious problem and a major threat to the achievement of the Millennium Development Goal (MDG) and it is estimated that 60% of under-five deaths in developing countries are attributable to it.[2] Worldwide, 5 million children die every year, that is to say one child in every 6 seconds.[5]Malnutrition accounts for over 50% of death in children in Nigeria[7].

To address these major health problems caused by malnutrition, monitoring of growth using growth chart becomes of great importance among health workers in general and mothers/caregivers in particular.

1.2 Types of Malnutrition

There are three types of malnutrition which are under-nutrition, over-nutrition, and nutrient deficiency.[8] Over nutrition occurs when nutrients are oversupplied relative to the amounts required for normal growth, development, and metabolism. The term can

refer to obesity, brought on by general overeating of foods high in caloric content, as well as the oversupply of a specific nutrient or categories of nutrients, such as mineral or vitamin poisoning, due to excessive intake of dietary supplements or foods high in nutrients (such as liver), or nutritional imbalances caused by various fad diets.[34]

Micronutrient deficiencies are when a child is lacking essential vitamins or minerals such as Vitamin A, iron, and zinc. Micronutrient deficiencies in children are associated with 10% of all children's deaths.[35] Under-nutrition is not getting enough protein, calories, vitamins and minerals which the body needs to function. This results in stunting, underweight and wasting. Stunting refers to low height-for-age (also known as chronic malnutrition), under-weight is measured by low weight-for-age and refers to a child whose weight is too low for its age and wasting is described as low weight-for-height which can be acute, moderate or severe. Under nutrition could also be due to specific nutrient deficiencies.[9] The different types are Marasmus, Kwashiorkor, Marasmic-kwashiokor and Micronutrient malnutrition. Marasmus occurs when children do not get enough energy-giving food and this either result in stunting, under- weight or wasting. In Kwashiorkor, the child does not get enough variety of the right kind of food, for example if they eat only cereal-based meals, it results in stunting, under- weight, wasting and oedema. Marasmic-kwashiokor is a combination of Marasmus and kwashiorkor symptoms. Finally, in micronutrient malnutrition, the child lacks micronutrients such as vitamins A, B and C, folate, zinc, calcium, iodine and iron.[7]

1.2.1 Malnutrition among children in Nigeria

It is estimated that about 16% of the world children are moderately under-weight, 9% severely under-weight, 10% are suffering from wasting and 27% from stunting. The worst cases are recorded in sub-Saharan region as shown in Figure 1 where 20%, 9% and 39% of under-fives are suffering from under-weight, wasting and stunting respectively. Between 2006 and 2010 alone, it was estimated that one child in every three under-five children in West and Central Africa was likely to be stunted at 5 years of age.[8]

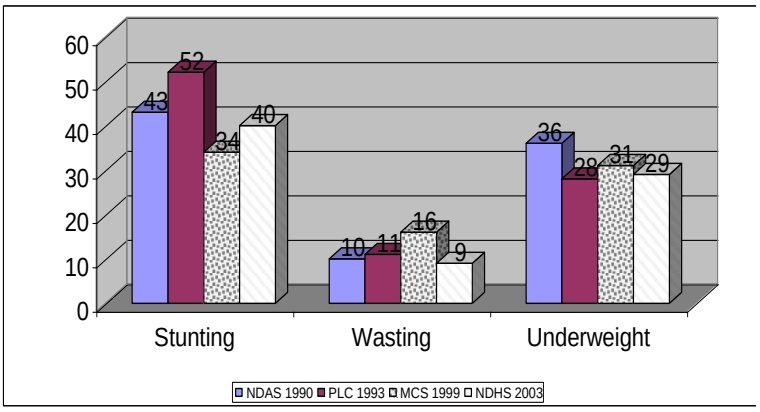


Figure 1: Comparison of stunting, wasting and underweight in Nigeria, 1990 -2003

Source: NDAS 1990, PLC 1993, MCS 1999, NDHS 2003

In Nigeria, child mortality and malnutrition rates are far higher in the North East and North West geopolitical zones than in other parts of the country as compared and shown in Figure 2.[18] Even though child mortality rate has declined slightly over the past five years, there are still about 16% of children in Nigeria who will die before they are five (5) years old and above 25% of these deaths share direct link with malnutrition even

though most of the deaths will be from highly preventable causes such as malaria, respiratory infections, diarrhoea, and measles.[2]

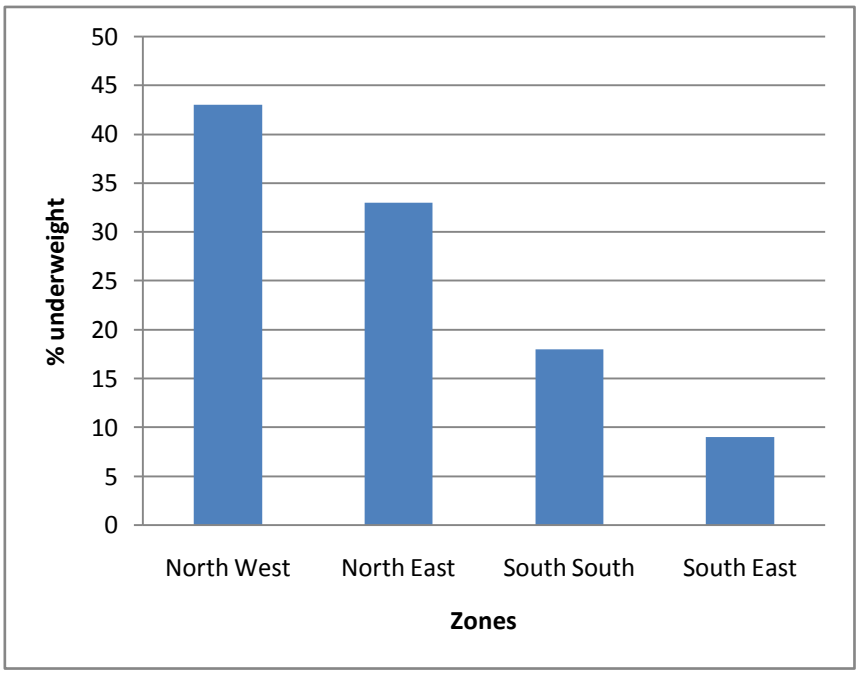


Figure 2: Under-five Children Underweight by Geopolitical Zones

Source: The Nigerian Academy of Science, 2009

1.2.2 Strategy for overcoming malnutrition

Different communities have different strategies for addressing malnutrition and any prevention strategy may differ from one individual to another.[2] Also, no one single strategy can stand alone and inter-sectorial collaboration is often required.[10]The key for effective malnutrition prevention is integrating health care, household food security and care as proposed by the model of Conceptual Framework of malnutrition by UNICEF.

A number of components of malnutrition primary prevention programs have been developed and tested over past decades throughout the world in a variety of political and

social settings. Firstly, promotion of early contact between mother and infant to improve chance forsuccessful breast feeding is important. It is good to establish hospital and other health routines that support breast feeding while in the maternity ward and later, successful early bonding and documented breast feeding is vital as well as supporting breast feeding by health team and by legal framework that promotes, protects, and sustains the right of working women to practice it.[11]

Secondly, monitoring of growth and development with adequate standards (present standards are being revised based on present recommended feeding modes) is proven to be effective and intervention is instituted only when appropriate to prevent malnutrition and specific micronutrient deficits.[11] Mothers should be familiar with growth monitoring charts and be ready to take appropriate actions when growth faltering occurs.[16] The degree of actions taken by the community will depend on the strength of the primary health care.[1]

Thirdly, it is important to introduce appropriate micronutrient rich complementary foods and supplements at 6 months of age.[9] If complementary foods are needed earlier, consideration of the risks associated with interference of breast feeding should be made. Ideally these should be based on local foods that are accessible to the population.[2] Micronutrient will be required in most cases and new developments include fortification at the household level either with tablets, sauces or sprinkles.[13]

Next is the identification of infants at risk for malnutrition and growth failure based on biological and social risk factors is a further strategy by providing adequate social and

medical support for families with children at risk.[11] Early identification should be based on community surveillance not only of growth but of caring practices and of critical food insecurity. Early interventions at this level are significantly more cost effective.[17] This area is presently receiving insufficient attention despite being at the core of the problem.

A fifth strategy involves education of parents and adolescent girls (would be mothers) on how to promote growth and development through appropriate home environment, care, and stimulation.[18] Verbal and cognitive stimulation for malnourished children results in higher growth rates than for children without such stimulation.[21] Interactions with parents, caregivers, and other children are essential for the young child and these interactions can be improved by education of parents and other caregivers. Care initiatives should go beyond focusing on individual practices and behaviors to bring in dimensions of care for the family and the community.[21]

Finally, provision of universal coverage of children to basic health care services, full coverage for all children with immunizations to prevent infectious disease, and avoid their adverse effects on nutritional status and provide early diagnosis and treatment of diarrheal disease at the community level using oral rehydration is paramount.[13] Linking this effort to the community based surveillance for effective prevention and control of mild and moderate Protein Energy Malnutrition (PEM) will compliment all other efforts.

Depending on what is available in the country the approach may not require expensive infrastructure but rather be community based and sustained. Treating hundreds or thousands of affected children will not solve the problem of malnutrition as a global public health problem.[13] Unless society at large confronts this issue in its full dimension the problem will continue. Access to adequate amount and quality of food represent a basic human right and is a necessary precondition for health. In turn good nutrition and health are prerequisites for human, social, and economic development. Physicians and especially pediatricians should not be passive bystanders but rather be activists in this process.

Another good way to begin intervention strategies is to look up the UNICEF framework of the basic, underlying and immediate causes of malnutrition and seek to proffer solutions to these problems, so that the strategies can then focus on individuals, households, communities and the nation in general. Countries can save children's lives through these interventions by establishing adequate referral arrangements for children with complication and ensuring funding to provide free treatment and to integrate the management of severe acute malnutrition with other health activities such as the integrated Management of Childhood Illness.[26]

1.3 Statement of the problem

Malnutrition accounts for over 50% of death in children in Nigeria.[7]Malnutrition leaves children more vulnerable to serious illness and early death.[5] Globally, in 2011, an estimated 165 million children below 5 years of age were stunted and 101 million were underweight.[6] Under-five deaths are increasingly concentrated in sub-Saharan Africa

and Southern Asia.[7]As high as 80% of the world's under-five deaths in 2011 occurred in only 25 countries, and about half in only five countries – including Nigeria.[5]According to (State of world children) SOWC 2012, 41% of under-five children in Nigeria are stunted and 23% are under-weight.[14] Malnutrition, especially under-nutrition may continue to be a serious problem and a major threat to the achievement of the Millennium Development Goal (MDG) if early and regular monitoring of growth using growth chart (also known as "road-to-health"), is not taken as a thing of great importance among health workers in general and mothers/caregivers in particular. Without any intervention, severe acute malnutrition has up to 60% mortality risk and children with severe acute malnutrition are nine times likely to die from any causes than those who are not.[7] One such intervention, which has proven to help improve the chances of survival of such children, is the growth monitoring program.[18,19] The program presents a preventive approach to addressing malnutrition problems as it gives early warning sign; and the chart can serve as veritable diagnosing tool even in the hands of the mothers.

Role of mothers in growth monitoring

It is known that of all the major interventions stressed in the Child Survival Program, growth monitoring requires the highest level of participation and instruction. It will, and often does, function the most poorly of the four growth monitoring, oral rehydration, breastfeeding and immunization (GOBI) components.[16] To buttress this, the success of,without the active involvement of mothers, health workers and the community, growth monitoring child survival projects and programs depend not only on

technical interventions themselves but on their being accepted and used by the millions of mothers and other child caretakers who determine in developing countries whether a child lives or dies.[24]

The involvement of mothers and families in the weighing of children is part of a movement to increase the involvement of families and communities in health-related measurement.[12,]The dietary changes and subsequent nutritional improvement evolving from her participation in the growth monitoring program are processes she must understand and take responsibility for. Mothers' participation in growth monitoring helps them make informed decision which leads to fundamental change in family nutrition knowledge or practice.[19]

Involvement of mothers in growth monitoring improves their level of nutritional knowledge and makes them more involved due to the monthly increase in the weight of the child as recorded on the chart make meaning to them.[20] Also, they appreciate the need for a line that shows a continuing upwards trend and may also assist in teaching adult numeracy, which in many situations may be as important as adult literacy.[20] Furthermore, mothers' role is also shown in their early intervention when faltering in weight gain, as shown by a flattening of the growth curve, when educated on what to do and this may lead to improved children's health.[21]When curative functions are separated, the mother will more likely understand that she is the principal actor in growth monitoring with respect to her child.[24]

The knowledge, understanding, practice, utilization and interpretation of growth monitoring /growth monitoring chart among mothers/caregivers in developing countries is generally poor. The extent of practice and attitude to its use among them varies from one community to another.[1] Nigerian mothers are not sensitized or mobilised to have adequate knowledge and awareness of the growth monitoring chart. Subsequently their level of knowledge, utilization especially as it involves charting the growth and interpretation of the plotted measurements on the charts of their children is questionable.[1]

They are therefore not able to detect any weight faltering or have an idea when nutrition intervention is needed. Nevertheless growth monitoring introduced in Nigerian health system has been helpful as it is now a standard package of care at Primary health care level. In some communities UNICEF has introduced community growth monitoring programmes. The poor educational level(below primary school), age at which mothers start having children(e. g below 18 years) and low level of income are factors that negatively influence the appropriate utilization and interpretation of growth monitoring chart. The knowledge of growth monitoring chart involves the awareness of its existence, frequency of weighing, the purpose of growth monitoring chart, knowledge of vital information on the growth monitoring chart.

Of importance also is knowledge of correct taking of a child's weight/height and plotting of the same by the mothers. The practice of utilising the growth chart involves appropriate frequency of weighing according to the child's age (0 to 1yr once a month, 1 to 2yrs once in 2months, & 2 to 5yrs once in 6months), attendance at the clinic for

growth monitoring alone. Correct interpretation of the growth curves (i. e joining together the sequential plotted weights). In spite of growth monitoring as package of care at Primary health care level, knowledge remains poor.

Mothers/caregivers do not actively participate in growth monitoring practices. The most probable cause for this may be their inadequate level of understanding of the benefits of growth monitoring using the growth chart and the attendant threat of malnutrition otherwise. To effectively curtail high mortality associated with malnutrition in under-fives, mothers/caregivers should be involved in early and regular monitoring of their children's growth using the growth monitoring chart to know the growth trend and detect any faltering that may occur for immediate intervention. To achieve this, mothers/caregivers should have good knowledge on the proper utilization of the growth chart for growth monitoring.

1.4 Aims and Objectives of the Research

General Objective

The aim of the study is to assess mothers' knowledge and understanding of the growth monitoring chart in Gwamna Awan General Hospital Kakuri, Kaduna.

Specific objectives are:

- To assess the level of knowledge of mothers of under – fives attending the clinic on growth monitoring chart.
- To assess the attitude of mothers of under – fives towards the growth monitoring chart.
- To determine the practice of growth monitoring.

- To assess mothers correct interpretation of growth charts.
- To identify factors that influence mothers' knowledge of growth monitoring.

1.5 Rationale /Justification

This study has been done to ascertain whether mothers understand growth chart data and its use in charting, plotting and interpreting the growth curve. It was also to assess their attitudes towards the use of growth monitoring chart as a tool to prevent malnourishment in their children. This research highlighted the percentage of mothers/caregivers who had the awareness, knowledge, attitude to, practice and interpretation of growth monitoring chart in the study area. It also identified the socioeconomic factors that influenced their knowledge of growth monitoring chart.

The result from this study can facilitate the development of more effective strategies for creating awareness, demand for the use of growth monitoring charts, educating and counselling mothers about their children's growth.

This research is significant because it highlighted the need for mothers to evaluate the effects of routine growth monitoring on the child in relation to illness, malnutrition; to prevent death and late referrals for medical care, nutritionist attention, medical specialist assessment or professional social support follow-up. It points out the importance of mothers/caregivers' awareness on the essence of good nutrition to their children's health and wellbeing.[16]

It also highlights the need to raise the knowledge of the mothers on evaluating the effectiveness of growth monitoring as well as the need for all health workers in care of children to know how to correctly weigh, plot, interpret the plotted growth monitoring chart and communicate same to mothers. Finally, it would ignite the interest for the replication of same study in other Primary Health Care Centres, across Nigeria and Africa.[1, 2]

CHAPTER TWO

LITERATURE REVIEW

2.1 Growth Monitoring

Growth monitoring is a process of sequential measurement for the assessment of physical growth and development of children in the community with the purpose of promoting the child's health, human development and quality of life.[12] It involves regularly measuring the weight (or height) of children, plotting the information on a growth chart to make abnormal growth visible and where growth is abnormal, the health worker does something, in concert with the family.[1] As a result of these actions, the child's nutrition improves, the child receives appropriate social or medical support or after appropriate investigation, a serious condition is diagnosed earlier.[9]

Khadikar defines Growth Monitoring (GM) in terms of its application as "a screening tool to diagnose nutritional, chronic systemic and endocrine diseases at an early stage".[10] Vee et al defines it as a process which involves "regular measurement, recording and interpretation of a child's growth change in order to counsel, act and follow up results".[11]It practically requires taking the same physical anthropometric measurements such as weight, height/length and head circumference at regular intervals; precisely plotting measurements on the appropriate, validating growth chart; correctly interpreting the child's pattern of growth; discussing the child's growth pattern with the mothers/caregivers and agreeing on subsequent action when required; and on-going monitoring and follow-up, when required, to evaluate the response to the recommended action to improve the child's growth. This forms the basis of remedial actions in the event that the weight is found to be abnormal.[16]

2.1.1 History of growth monitoring

The history of growth monitoring started with weighing and the charting of a weight-for-age graph of children in West Africa in the late 1950s.[4] Two innovations were introduced to make the graphing of weights more practical. The first was the introduction of a calendar, which started with the birth month of the child, against which the weights were plotted and the second, which was perhaps even more important, was that these charts were home-based and held by the mother of the child.[4] This initiated a new worldwide trend for patient-held health records.

The growth chart as we have it today was a product of over half a century of research and development which climaxed in the 1970s. One of the key scientists and also one perceived as the father of growth charting in some quarters was Dr. David Morley.[12] He noted that their first ideas came from a child health research project in Newcastle, England and that subsequently, they got much field experience from a long-term study of child growth in Imesi, Nigeria.[12] The chart was first designed by him and later modifications were standardized by World Health Organization.[15] The improved chart has so far been praised as a veritable tool for an efficient paediatric health recording system, which at a glance would provide records such as age, immunization status, past illness and at-risk status and can be used for several other purposes in child care.[13]

The first mention of the use of any form of tool where the weight and age of a child is monitored and recorded in Nigeria was during the first longitudinal study in Africa carried out by Dr. David Morley in Imesi-Ile, old Western Nigeria (Morley and Woodland, 1979).[12] He started under-fives clinics in Nigeria which was run by local personnel and he trained local women to immunize the children. He also devised the

'Road to Health' growth chart – a concept which has spread around the world. When he first arrived Imesi-Ile, measles killed 1 in every 20 children.[2] He tried a new vaccine from the USA, at first on 20 children, and then on all the children within the community from 1962 to 1965. By 1965 Imesi-Ile had become the very first community in the world to record the eradication of measles through vaccination.[2]

Strategy of growth monitoring

Growth monitoring, as easy as it may sound, requires mobilization and participation of relevant stakeholders at individual, community and national levels.[17]

Individual level

Mothers/caregivers of children should be appropriately educated and mobilized at the first contact on the relevance of growth monitoring. The responsibility should be made to lie on the mothers/caregivers who should regularly weigh and keep record of their child's progress and provide feedback to community and get appropriate support from the health worker.[1,17]

Community level

A well mobilized community is key to growth monitoring strategy. The activities may involve setting up growth monitoring week or days through a well organized community development committees and provision of periodic education for mother. Incentives and rewards for community performers can foster mothers' increased participation.[20] The committees can provide support to indigent families and also encourage homestead farming.[2]

Health Facility level

Growth monitoring programmes should be set up in all primary health care facilities and made available to all socioeconomic groups and sexes.[39] The programme may include counselling, education, treatment for growth-retarding illnesses, and feeding.[39] This way the role of growth monitoring in child survival was promoted and institutionalized.

When mothers bring their children to health facilities for immunization, treatment of various illnesses especially diarrhoea,growth monitoring and promotion should be introduced. Educating mothers directly during health talks on appropriate practical ways of rearing and feeding children is a preventive and promotive strategy. They learn about the relationship between diet and child's health.

National level

Policies and procedures could be enacted to create demand for growth monitoring at primary health care levels up to tertiary levels. Demand creation through mass awareness campaigns, integration of child monitoring into other national health initiatives and frameworks should be instituted by the federal and state governments.[23,24] Economic issues should be continually addressed to harness improved food security, decrease poverty and increase access to health care.

2.2 History and Development of Growth Monitoring Programmes

Growth monitoring, particularly of infants and young children, is widely regarded as an essential element of primary health care and in a recent survey, 154 of 178 Ministries of

Health (88%) reported that they monitor child growth.[19] The potential of growth monitoring lies in its use as a diagnostic tool for identifying a child with a nutritional or health problem, thus enabling action to be taken before the child's nutritional status is seriously jeopardized.[20]

Most growth monitoring programmes use weight charts to provide a graphic representation of a child's weight-for-age. An undernourished or sick child will have a slower rate of weight gain than a well-nourished, healthy child. Monitoring growth by plotting a child's weight at regular intervals and comparing the pattern of growth to reference curves of healthy children permits early detection of growth faltering.[17] It provides an early warning signal and a trigger for early action.

Growth monitoring has a long history. Regular weighing of infants was advocated by Guillot in the 1850s for assessing the adequacy of lactation in neonates, and in the 1870s Cnopf in Nuremberg was the first to weigh infants systematically beyond the perinatal period, while Russow in St Petersburg was the pioneer of growth standards and of the idea that growth reflects an infant's well-being.[20]

In 1961 the use of growth charts was recommended by a joint committee of the Food and Agriculture Organization and World Health Organization.[21] The name 'Road-to-Health chart' originated in Malawi, but much of the pioneering work and advocacy for monitoring growth in developing countries was by Dr David Morley and colleagues at Ilesha, Nigeria.[12] Over the years many different types of growth chart have been designed: many additionally serve as child health records showing illness episodes,

immunization status etc. and provide advice, for example on child feeding, oral rehydration, and care-seeking.[19]

The direction of the child's line is emphasized, that is, whether rising in parallel to the reference curve (good), or flat (early warning) or falling (danger sign). In the 1970s growth monitoring was implemented in several developing countries in Africa, Asia, Latin America and the Near East both by governments and by agencies, notably the Catholic Relief Services and the United States Agency for International Development.[19]

Many systems emerged and WHO coordinated efforts to develop a standard weight chart and published guidelines for its use in health services.[21] Support for growth monitoring and promotion grew considerably in the 1980s and the United Nations Children's Fund (UNICEF) was an enthusiastic advocate.[5] It was a key component of UNICEF's selective primary health-care strategy that promoted growth monitoring, oral rehydration, breastfeeding and immunization (GOBI). UNICEF also championed community involvement in health care: the approach was to make low-cost, simple technologies available to improve health of all children at risk.[6,7] UNICEF provided countries with weighing scales and supported the local production of growth charts. Sufficient funds to build local capacity to make the programmes work effectively, however, were not allocated.

Although growth promotion had always been envisaged as an integral part of growth monitoring procedures, promotive actions were often eclipsed by weighing and

charting. The term ‘growth monitoring and promotion’ was therefore introduced to make growth promotion an explicit component.[10]

In 1990, Samir Basta, then Director of the UNICEF Evaluation Office, initiated an evaluation of UNICEF-supported growth-monitoring activities in seven countries, namely Malawi, Ghana, USA, India, Oman, Norway and Brazil.[21] This revealed low coverage, poor understanding of the causes of malnutrition, and few growth-promotion actions. Although the Report concluded that UNICEF had invested insufficient funds to make the programmes work, many took the Report to mean that growth monitoring activities were ineffective.[21] The Report led to discussions that reshaped UNICEF’s policies and strategies and in the 1990s there was disinvestment in community-based nutrition programmes and a notable shift in expenditure away from growth monitoring towards breastfeeding promotion, immunization and micronutrients, especially vitamin A and iodine.[20] Limitations encountered in disease-specific child health programmes led to the development of the current WHO/UNICEF strategy of Integrated Management of Childhood Illness (IMCI), which was first introduced at country level in 1996 with the aim of reducing child mortality.[24]Within IMCI, growth charts are used to classify a child’s weight-for-age to guide decisions on follow-up and referral. Emphasis is given to nutrition counselling at every sick-child contact rather than on regular growth monitoring.[22]

2.3 Objectives of Growth Monitoring

The main aims of growth monitoring, as originally conceived, are as follows:

Provide a diagnostic tool for health and nutrition surveillance of individual children and to instigate effective action in response to growth faltering.

Teach mothers, families and health workers how diet and illness can affect child growth and thereby stimulate individual initiative and improved practices.

Provide regular contact with primary health-care services, and so facilitate their utilization. The underlying logic is that if growth faltering is detected early and is made *visible* to health workers and families, then families can respond by changing their child-care practices, provided they are offered proper motivation, given clear, feasible alternatives, and given a role in deciding what practices they will try to change.[19]

Subsequent objectives of growth monitoring that have been developed include:

Community mobilization: Growth monitoring can serve as an entry point for community mobilization and social action, especially when growth monitoring data are aggregated and used for community-level assessment and analysis of child malnutrition.[2] The premise is that caregivers' participation in growth monitoring will lead to increased awareness of factors that detrimentally affect children's health and that they will influence community leaders and citizens to take collective and effective action to address underlying socio-economic causes of poor health and promote social and economic equity. This is in keeping with the Alma Ata Declaration of 1978 which emphasizes the need for community and individual participation in primary health care.[2]

Targeting supplementary feeding: The weight chart is widely used to determine eligibility for entry to supplementary feeding programmes. The criterion is usually a weight-for-age below one of the reference curves on the weight chart, equivalent to 'moderate' underweight. This invariably shifts the focus of growth monitoring towards identifying children who meet this criterion, rather than intervening at the first sign of growth faltering. Consequently no action is taken until the child is significantly underweight. As health workers choose who should receive assistance, the collaborative involvement of families in decision making is lost, as well as any educational benefit of regular growth monitoring.[1] Using weight charts in this way is thus contrary to the precept of growth monitoring. Anecdotal reports suggest that once enrolled in supplementary feeding programmes and approaching the exit criterion, some children may be purposely underfed so as to remain beneficiaries.[22]Although, supplementary feeding programmes may have their place in offsetting food shortage, growth faltering is often the result of poor feeding practices, which can still prevail even among beneficiaries of food distribution programmes.

Reporting prevalence of underweight: Governments and agencies may require health workers to provide information on the extent of underweight in their locality, or the number of children failing to grow in a given month.[1] Currently over 50% of countries transfer information obtained from growth monitoring to higher levels.[19] In some countries time-consuming procedures are devised, with information systems spanning village, district, provincial and national levels. In Vietnam, for example, it takes several days each month at district level to collect and aggregate village data in order to report to higher authorities the prevalence of underweight and coverage of child weighing.[2]

2.4 Expected Benefits of Growth Monitoring

The main anticipated benefits in developing countries are reductions in under nutrition, morbidity and mortality among young children.[17]Linked benefits include early intervention when growth faltering is more easily remedied; improved knowledge about the effect of diet and illness on growth; families motivated and enabled to take effective action; nutrition and health counselling tailored to individual needs; opportunity to assess remedial actions; greater self-reliance and self-esteem; greater utilization of preventive health-care services; fewer referrals for curative care; cost savings; and communities mobilized to address underlyingsocio-economic causes of poor health.[20]

2.5 Growth Chart (GC)

The Growth Chart (see Figure 3) is used to interpret data collected from measurements taken during growth monitoring. Other information that are readily available in the chart include the immunization status, parity of the mother, vital information of the child like name, age, sex, birth date, address, name of parents and some information about the siblings, how to breast feed and how to prepare oral rehydration salt (ORS) for diarrhoea therapy. It is a graph developed based on standards by global organisations like WHO, UNICEF and various international departments for child care and health.[20]

The methods of assessment of the growth chart can be based on Mean/median values where a variation of 2 Standard deviation is considered normal and Percentiles where 94% of children fall between 3^{rd} -50^{th} percentile; 3% of children fall below 3^{rd} percentile and 3% of children fall above 50^{th} percentile. While these are based on weight for age, weight for length and weight for height is also utilized in the assessment of growth monitoring.

Also, there are longitudinal assessments which measures growth parameters of same individuals over a period of time and cross-sectional assessments used in surveys to estimate prevalence of malnutrition.

For the purpose of standardization, the world health organization has given reference values to be adopted. Depending on the nation, these include the National center for health statistics (NCHS) reference values, which has been in use since 1970s. Its major drawback is that the study was conducted in the US alone. Multi center growth reference study (MGRS)was conducted in 6 countries: USA, Ghana, India, Norway, Oman, and Brazil between 1993-2003. It is a better reference values that allows for international comparison.

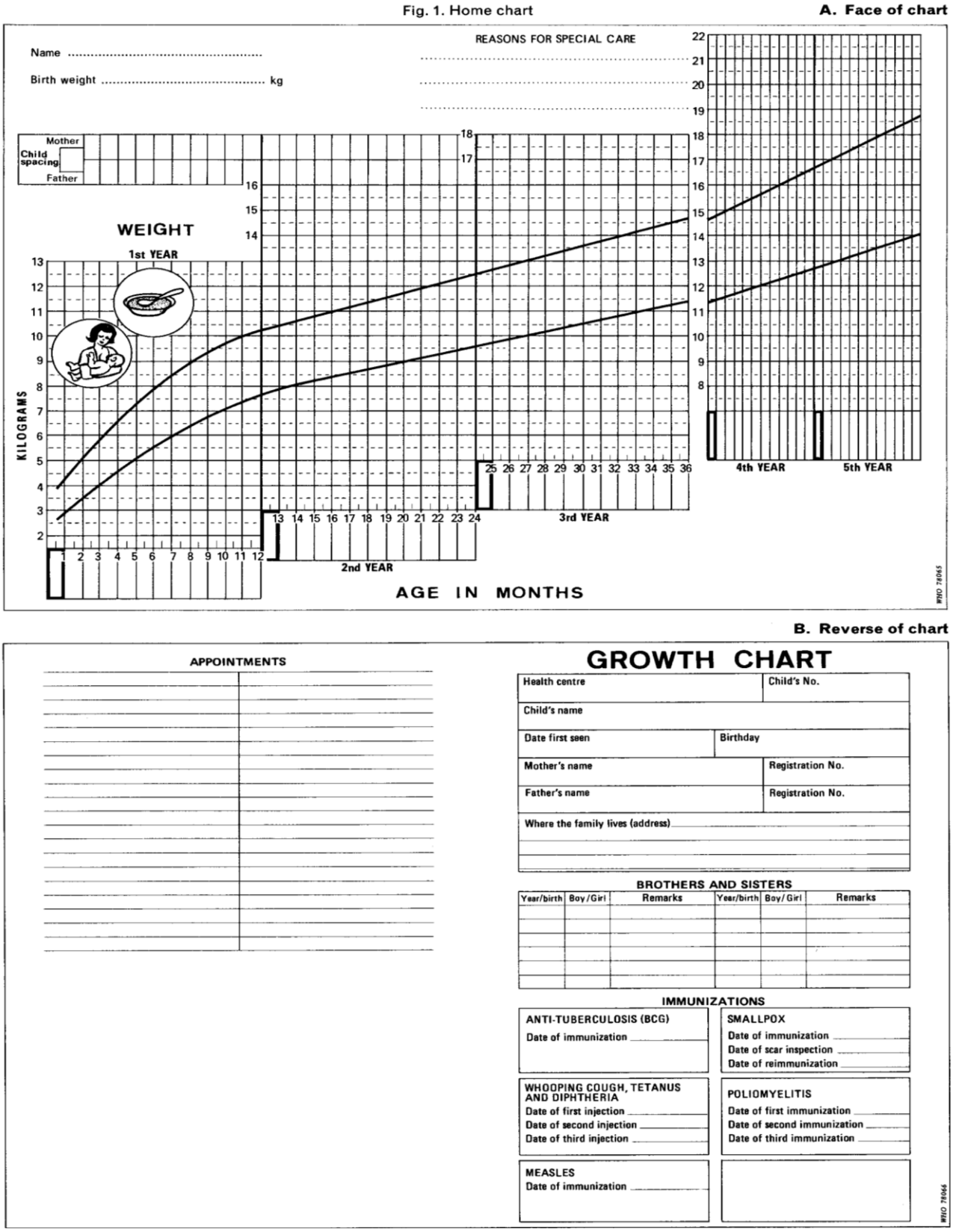


Figure 3: Road-To-Health (RTH) Growth Chart

Source: Growth monitoring: challenges and constraints[20].

The Harvard standard is suitable for European nations and the other is the Indianstandards.[20]

Basically, variables such as body weights, height or length are plotted against the age of the child. The resulting curve is then studied against reference lines to understand the health situation of the child under study. The weight in kilogram (kg) or height/length in centimetre (cm) is scaled on the vertical (y) axis of the chart and the age in months is scaled on the horizontal (x) axis. The upper curve is called the 50th percentile while the lower curve is known as the 3rd percentile. The space between the 2 curves is the zone of normality, where the weight curve of a normal growing child should fall. The direction of the child's growth curve should point upward in line with direction of the reference curves; any deviation is an early sign of PEM and should be appropriately managed. Khadikar reported that in India for instance, under-five clinics weigh the child at periodic intervals monthly during its first year, every 2 months during the second year, and every 3 months thereafter up to the age of 5 or 6.[10] However, worldwide practice is to weigh the child once monthly in first one year, once in two months after one year up to two years and two times a year at age 2 to 5 years.[19, 21]

The interpretation of the growth chart is simple. Four basic categories of growth curve can be obtained from the growth chart.[1, 20]Chart 1 shows a child with over nutrition and the curve is above the zone of normalcy and points upwards (Appendix 2); Chart 2 shows a child's plotted weights within the upper & lower reference curves and on the upward trend indicating a normal healthy curve (Appendix 3); Chart 3 shows child with static weight, though within the reference curves (Appendix 4) and Chart 4 shows a

child with severe malnutrition, the curve is on the downward trend below the lower reference point (Appendix 5).

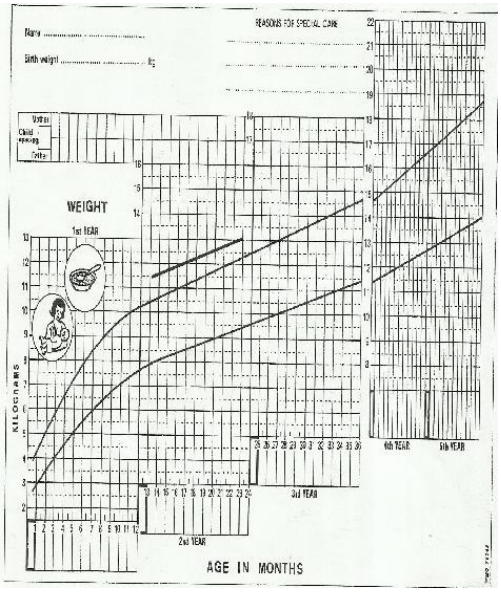


CHART 1- OVERWEIGHT

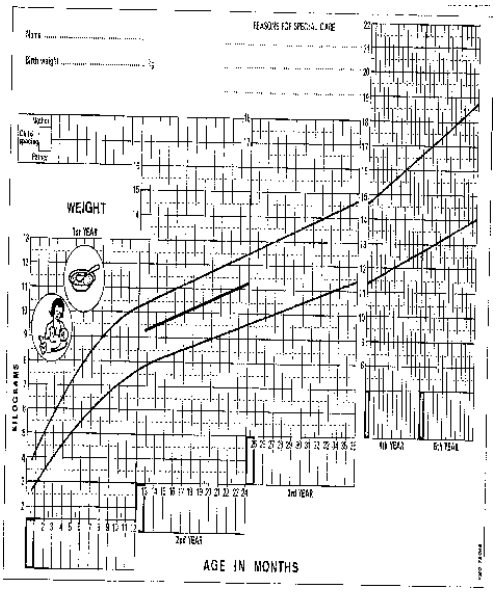


CHART 2- NORMAL

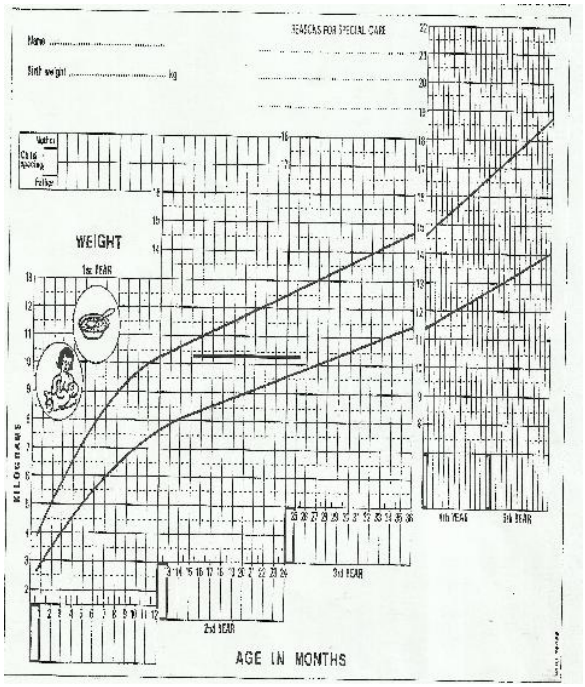


CHART 3-STATIC (NO GROWTH)

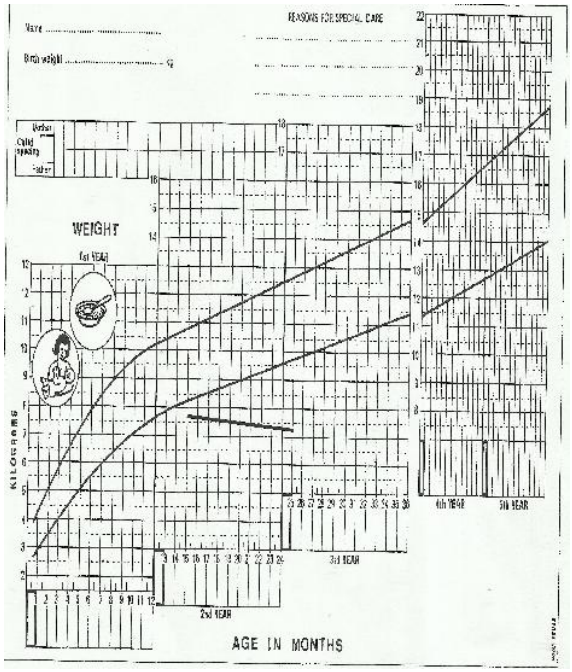


CHART 4- DANGEROUS WEIGHT

2.6 Mothers' Comprehension of growth chart, its efficacy and their Participation in Growth Charting

There appears to be a latent relationship between the qualities of knowledge mothers have on growth chart and the possibility of enjoying the benefits of growth monitoring.[17] The importance of the growth chart has been enumerated above and it has been suggested that growth charts can serve as an educational tool to make malnutrition apparent to both health workers and mothers.[18]

However, in order to meet this need, Roberfroid et al suggested mothers should be able to use and interpret the charts.[16] Masondo revealed that mothers could not interpret the growth patterns in the Road to Health Card. The study also revealed that although the mothers were aware that they were supposed to carry the Road to Health Card each time they visited the clinic, doctor or hospital, they did not carry these cards as required stating the reasons that the children were not weighed when they attended minor ailment clinics and that the health workers did not ask for the Road to Health Cards during these visits.[33] It has also been noted that maternal education regularly emerges as a root part of a comprehensive strategy of addressing malnutrition.[16,17]

2.7 Determinants of Malnutrition

This conceptual framework on the causes of malnutrition was developed in 1990 as part of the UNICEF nutrition strategy. The framework in Figure 4 shows that causes of malnutrition are multi-sectorial; embracing food, health and caring practices. They are also classified as immediate, underlying, and basic; where factors at one level influence other levels. The framework is used at national, district and local levels, to help plan

effective actions to improve nutrition. It serves as a guide in assessing and analyzing the causes of the nutrition problem and helps in identifying the most appropriate mixture of actions.

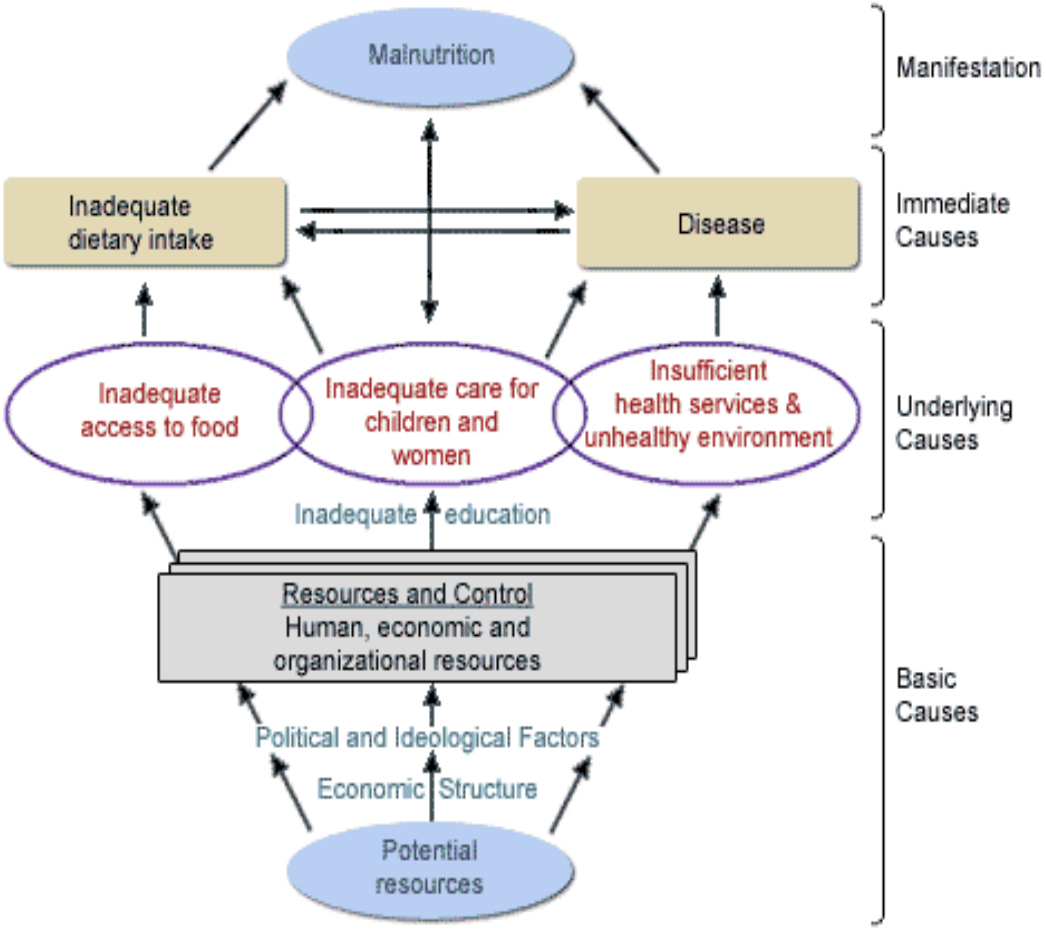


Figure 4: Conceptual Framework of Malnutrition

Source: UNICEF

According to this framework, malnutrition occurs when dietary intake is inadequate and health is unsatisfactory. These are the two immediate causes of malnutrition.[5] In developing countries, infectious diseases, such as diarrheal diseases (DD) and acute respiratory infections (ARI) are responsible for most nutrition-related health problems. Readily available food, appropriate health systems and a "healthy" environment are

ineffective unless these resources are used effectively. As a result, the absence of proper care in households and communities is the third necessary element in the underlying causes of malnutrition. Finally, this conceptual framework recognizes that human and environmental resources, economic systems and political and ideological factors are basic causes that contribute to malnutrition.[6]

This model relates the causal factors for under-nutrition with different social-organizational levels. The immediate causes affect individuals, the underlying causes relate to families, and the basic causes are related to the community and the nation. Thus, the more indirect the causes, the wider the population whose nutritional status is affected.

The Food Security and the Malnutrition conceptual frameworks, which are the most common frameworks used in this field show significant differences.[9] It emphasizes an economic approach in which food as a commodity is a central focus. The malnutrition framework adopts a biological approach in which the human being is the starting point.[9] However; both frameworks have in common the promotion of an inter-disciplinary approach to ensuring food and nutrition security.

2.8 Consequences of Under-five Malnutrition

The World Health Organization cites malnutrition as the greatest single threat to the world's public health hence food production and poverty eradication as the first MDG. Malnutrition has serious consequences right from cradle, even into adult life. Malnutrition can have adverse effects on both individuals and communities and it can cause diseases and diseases can cause malnutrition as well.[8] Apart from health consequences; which include all forms of protein energy malnutrition, low immunity,

rickets, reduced growth, dermatitis, diarrhoeal disease, dementia and death; the conceptual framework on Figures 5and 6 further buttresses the importance of some socio-economic consequences. It tried to view the consequences from household and individual perspectives.

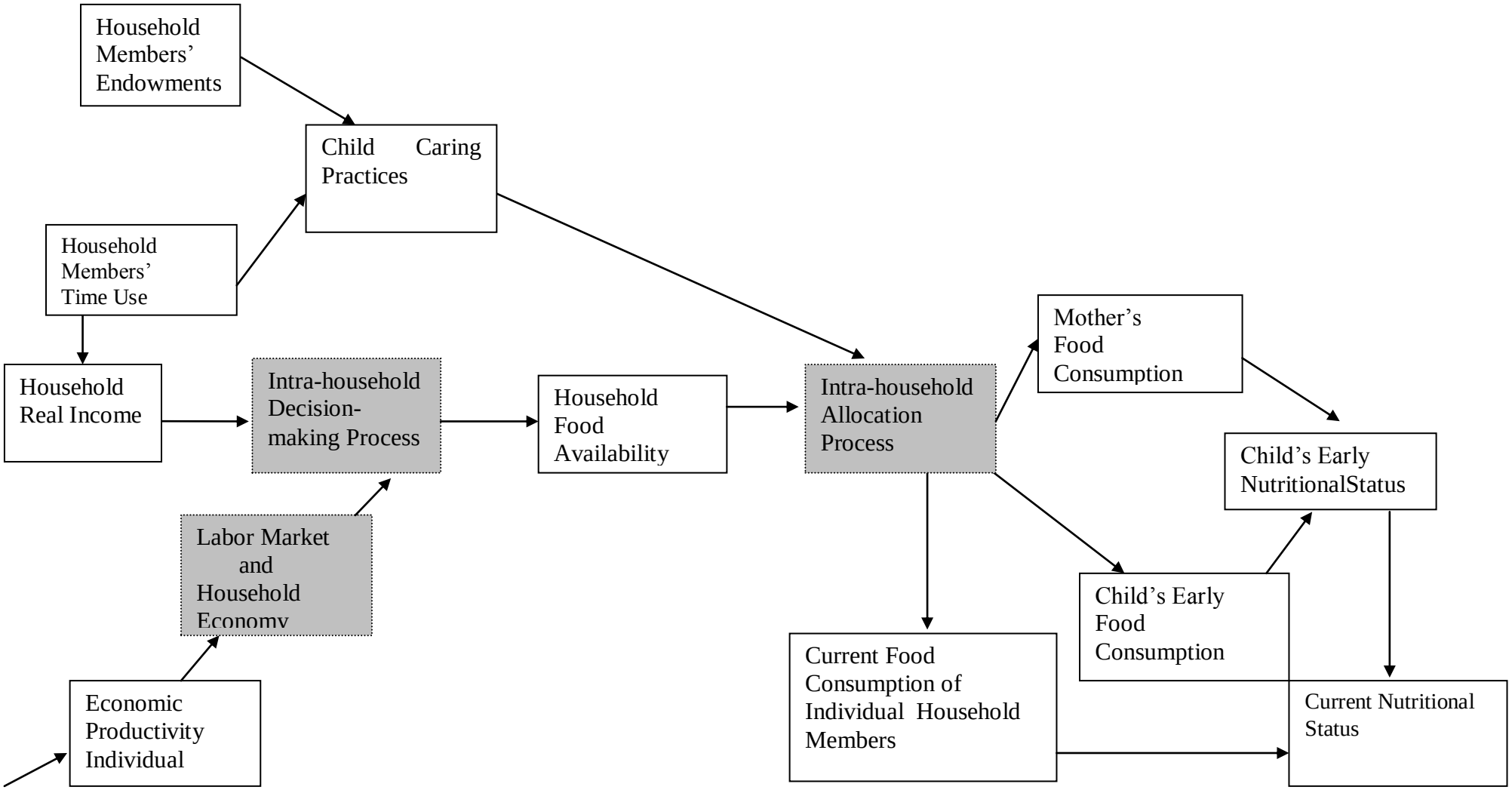


Figure 5: Conceptual framework for the economic causes and consequences of malnutrition: Determinants of early and current nutritional status[9]

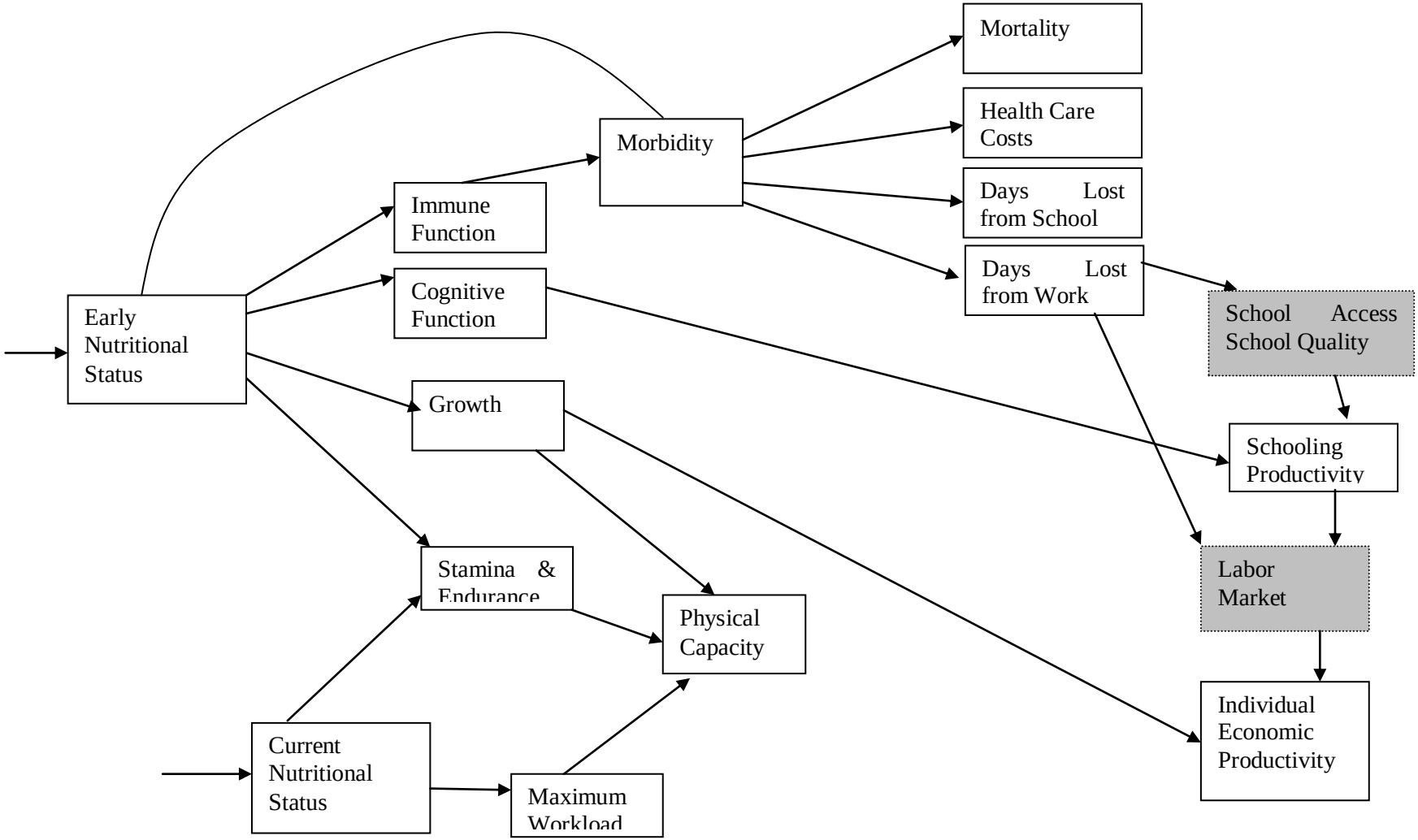


Figure 6: Conceptual framework for the economic causes and consequences of malnutrition
Determinants of individual economic productivity[9]

2.9 Advantages of growth monitoring

Growth monitoring has numerous advantages. The purpose is to educate mothers about the growth of their children and motivate them to take appropriate action to improve and maintain it.[12] This helps to prevent morbidity and mortality.

The growth monitoring chart is used as an educational tool to make malnutrition apparent to both health workers and mothers of under-fives. Mothers/caregivers must however understand the chart in order to fulfil this objective.[20]

The advantages of growth monitoring are also expressed by the fact that the children themselves are to be given a more complete clinical examination in the process of searching for disease-related causes of malnutrition. Here, they benefit from other services like immunization, oral rehydration therapy, vitamin A distribution, supplementary feeding, and education of mothers.[20] During health sessions, health information and referral service are extended to mothers.[20, 21]

Despite these advantages, the growth monitoring process and growth chart have a few challenges. After the immunization cycle is completed, children are not taken any more on a monthly/two monthly basis making it difficult to plot their growth.[20] Very often nutrition counselling and health education is not given along the weighing session due to lack of time and personnel also even if the weight-below-the-curve indicates suspicion of acute malnutrition, it is not a diagnostic feature.[4,5,20]

2.10 Gaps in mothers' knowledge of growth monitoring

So far, little thoughts have been given to how a mother/caregiver views weighing and charting, but great care needs to be given to this, since there is the likelihood that they may have many wrong impressions.[2] A health worker is literate; on the contrary in many cases mothers attending clinics would not be literates even for many years to come. Research has shown that many basic assumptions made by literate people may not be accepted by those who have had little or no education.[22] Hence there exist gaps in mothers' knowledge of growth monitoring.

Those who have never been to school may not accept the concept of constancy of mass and number and many mothers do not understand that the weight and rate of growth of their children are related to giving of breast milk and other foods.[22] Some mothers, in some cultures have resentment against weighing children, as they may associate weighing with selling.[2]

2.11 Perceived Reasons for Poor Awareness of Mothers on Growth Chart Monitoring

Two broad categories of factors that could mar mothers'/caregivers' comprehension of growth charting have been observed: conceptual (like interpreting growth trajectories) and practical (like the lack of equipment).[20] Poor participation of mothers in growth monitoring charting has been specifically blamed on factors like their lack of understanding of the significance of growth monitoring activities, improperly trained health workers on the concept, insufficient sensitization and mobilization of communities to support and demand growth monitoring, lack of access to adequate

measuring equipment and tools, and inadequate systems for providing follow-up support.[12]

In a study of 100 Bangladeshi mothers 36% of them had any form of awareness of growth chart.[29] However, over half of 518 women (53.7%) in a study in Ilorin semi-urban Nigeria community had heard of growth monitoring chart.[27]R.C. Ibekwe et al suggested that health workers are poorly trained even though they are virtually the only source of information on growth charts for 362 mothers in the study (90.3%).[36] Masondo showed that mothers were not given accurate information about the growth parameters of their children, especially with regard to the Road to Health Chart.[33]A global-scaled study on growth monitoring suggests that lower level workers are generally concerned only with the degree of the child's malnutrition rather than the shape of the growth curve.[19] It notes for instance that dots on the charts are left unconnected and low weight gain is not seen as a cause for alarm; so it becomes a case of the blind and negligent leading the blind and uninformed.

A study carried out in India to determine the knowledge on growth monitoring, revealed that 90% had adequate knowledge about the significance of the lines on the growth monitoring chart, but only 43% knew the correct age at which growth monitoring should begin.[20] In a Belgian study, where an international panel of District Medical Officers were interviewed on growth monitoring practice and promotion, it was discovered that the doctors had limited knowledge of the interpretation of the growth chart, though they considered it a tool for diagnosis.[21]

Also, another study showed that even though the health workers' awareness about growth monitoring was high (95.2%), their knowledge of the procedures was however poor with only 49.2%, 30.6% and 29.3% knowing the regularity of growth monitoring for children at 0-1 year, 1-2 years and 2-5 years of age respectively.[1,2,22] Furthermore, 37.1% did not know at what point on the growth chart is intervention necessary vis-a-vis the appropriate advice to give the mothers and the care to be instituted.[23]

Indifference has played its own role too. Until recently, the use of growth monitoring charts was perceived as a mere academic exercise even by some health workers (as evident in their neglect of monitoring activities) that have little or no effect on the health or growth of the child.[10] Gerein & Rosseven questioned its role in increasing the effectiveness of health care delivery and labelled it as a medical logic that is yet to be proved especially when there are yet to be sufficient well-designed studies on the issue).[26] Brownlee inferred that 'high level professionals, educated to play a curative role, often have little understanding of the detrimental effects on survival of the interaction between malnutrition, growth failure and infection. They often fail to either use growth monitoring as a tool in their own work or act on measurement results collected by those under them. Lower level workers thus are often unenthusiastic about monitoring tasks and may lack the needed technical skills as well'.[24]

The type of chart used has also been shown to affect comprehension. Several field reports have indicated that errors in plotting and interpretation are extremely common and that cards are often too complex, with culturally unacceptable design features.[2] The study conducted by Roberfroid et al which compared mothers' comprehension of two

different charts including the Road to Health (RTH) and the Growth Surveillance (GS) chart suggested that there was a significantly greater improvement for the group of mothers who received instruction on the RTH chart compared with those who were instructed on the GS chart.[16] It was observed that RTH appeared to be simpler to work with among the two and that its simplicity might have aided the level of comprehension it enjoyed. By extension poorly printed cards and charts; even those with wrong scales and axis discourages comprehension as well.[17]

The effects of socio-cultural beliefs and doctrines have not really been studied but some researchers can admit that they can as well affect maternal comprehension seeing that some traditional practices are in themselves opposed to orthodox medical science practices and traditional religions has its own ideas about child survival.[2] However, Brown Lee, attempting to discuss attitude towards weighing on growth monitoring mentioned that "in certain parts of India and Bangladesh, for example, the concept of the "evil eye" causes some mothers to be extremely reluctant to have their healthy children weighed. Weighing is at times seen as degrading, "as if the child was a piece of meat."[24]

It has been observed that poor community driven initiatives can affect maternal comprehension.[2] In fact, it was found that increasing the community's ability to rightly diagnose stunted and non-stunted children respectively as stunted and non stunted by 25 percentage points has similar effects as providing at least one female adult per household with primary education.[19] Professionals advise that it works to develop

innovative and culturally appropriate techniques for including the community in all phases of growth monitoring.[2]

The process of charting seems to have different applications that contribute to its effectiveness as an educational and promotional tool.[18] The programme is designed to make child growth apparent to both health workers and care givers. Efforts need to be made to equip mothers, health care givers and the community with reliable knowledge in such a way that the intervention will initiate a well-structured communication framework within all concerned. This will help reinforce care givers' current actions when growth is normal and has the capability to improve caring practices as observed by Roberfroid et al.[16]

2.12 Quality of Growth Monitoring

There are five main activities linked to growth monitoring and these are weighing accurately, plotting on a growth chart, interpreting the growth curve, discussing options with the caregiver and agreeing on future action and evaluating the child's response. Even though simple in concept, difficulties abound. Only 35 of 178 countries (20%) contacted in 1998–2000 reported having no problems with the use of growth charts.[19]

In 1985 at the request of WHO, Gopalan & Chatterjee reviewed global experience in the utilization of growth charts for promoting child nutrition, including experience from large-scale programmes in India, Indonesia and the Philippines.[25] They concluded that growth data were often inaccurate due to deficiencies in the technical aspects of weighing and charting, but the greatest difficulties lay in interpreting growth charts and

in initiating appropriate action. Little time was available for teaching mothers, and growth monitoring programmes were often conducted in isolation, instead of being part of an integrated package of other low-cost health and nutrition interventions. They warned that growth monitoring will be wholly futile in situations where the basic infrastructure for remedial or promotive measures is non-existent or inadequate, and that over-enthusiastic promotion of growth monitoring could result in a backlash of disillusionment. They provided further analysis of problems encountered and they also questioned the appropriateness of promoting growth monitoring if infrastructural inadequacies constrain effective action. It was then concluded that effective growth-monitoring activities are not easily implemented and that local realities are often not considered when making decisions about inclusion of growth monitoring in national programmes.[21] Likewise Gerein & Ross in 2001 concluded that the introduction of growth monitoring into under resourced and poorly managed health systems is likely to be a costly and relatively fruitless exercise.[26]

The problems identified by Bryce et al appear pervasive and enduring. In Burkina Faso, Niger and Mozambique none of the key activities was performed adequately: 21% of children were misdiagnosed and interaction with mothers was rare, low coverage and limited counseling were reported in large-scale growth monitoring programmes in fewer than 30% of mothers were counseled.[23] Lack of essential supplies and an unsupportive health system were said to demotivate community health workers leading to unsatisfactory growth-monitoring practices. The limited time available for interaction with caregivers continues to constrain effective action in many countries. In growth-monitoring clinics in Lusaka, Zambia, the mean contact time was 30 seconds, and in

three child health programmes in rural Zaire, 64% of mothers attending growth monitoring sessions received <2 minutes consultation time, and 43% received no advice at all.[23]

Health workers were reasonably good at weighing and charting, but lacked nutrition knowledge and communication skills, with the result that advice, if given, comprised brief, standardized directives.[17] Constant repetition of the same message, such as 'feed the child more greens' understandably exasperated some mothers. Bryce working in Ludhiana, reported that 10–15 minutes is needed for a meaningful contact with mothers and to elicit the needs and problems of the family.[23]

2.13 Potential Consequences of Withdrawing Growth Monitoring

If growth monitoring were withdrawn, health workers and mothers would lose in manifolds.[1]For example, a point of reference as to whether a child's weight is following the expected trajectory; an early warning of a health or nutrition problem; a visible portrayal of a health or nutrition problem; and a visible response to corrective actions.

They might also lose frequent, regular contact; the opportunity to intervene before a child's condition deteriorates; a focal point for integrating synergistic interventions; an entry point for timely discussion about child feeding, tailored to individual needs; an entry point for other preventive and curative services; satisfaction and motivation from seeing tangible responses to corrective actions; and an advocacy tool for community mobilization to address underlying causes of poor health.[22]

Governments and communities may also lose the conduit and driving force for delivering a package of community-based nutrition, health and poverty reduction interventions. The issue is whether better delivery of key interventions (like interventions to improve breastfeeding and complementary feeding) and maintaining regular contact (for instance with home visits from community health workers) might lead to improved behaviours without recourse to growth monitoring as was found in Tamil Nadu, India or whether growth monitoring might assist health staff and programmes to function more effectively.[23]

2.14 Feasibility and Conditions under which Growth Monitoring can be Expected to Work

Growth monitoring is clearly a waste of time and money if it is not linked with actions that promote good growth.[2] As poor growth is often linked with poor infant feeding practices, an important action is nutrition counselling. Many health workers lack adequate knowledge and communication skills; poor performance stems in part from inadequate training and lack of supervision which adds to the problem.[3] In some situations a weak infrastructure further constrains the actions that can be taken. These problems are compounded by the conceptual confusion surrounding growth monitoring in primary care settings, with the result that its purpose is diversified.[22] Thus growth monitoring was used for community mobilization in Iringa (Tanzania), for targeting supplementary feeding in Tamil Nadu (TINP, India), for targeting and guiding nutrition education in the Dominican Republic, and for no apparent purpose in Colombian day-care centres.[23]

This conceptual confusion may be exacerbated if growth charts become a child rights' instrument. Possession of a growth chart with a minimum of five recorded weights in the first year has been adopted by some governments as showing their commitment to the right of a child to have the highest attainable standard of health. The risk is that setting numerical targets may further divert attention from the growth chart as an educational tool for promoting healthy growth.

The conditions that favour good growth monitoring and growth promotion include but not limited to well organized, functioning health system; clear objectives as to the purpose of growth monitoring; integration of growth monitoring with preventive/curative health services and intersectoral linkages; integration of nutrition education into all paediatric services; high coverage of children at risk; high degree of implementation; trained health workers with good communication skills and knowledge; adequate time allowed for nutrition counselling; experiential and observational learning techniques to promote behavioural change; regular support and supervision of health workers to maintain good performance over time; induction and training of new staff; service delivered locally at convenient times; caregivers having good access to attend or being visited at home; and formative research used to develop key messages that are actionable, feasible, memorable and used at all points of contact.[19]

2.15 Monitoring Considerations and Recommendations

Malnutrition contributes to 50–60% of all deaths among under-five children so that child mortality cannot be reduced or Millennium Development Goal 4 reached without

addressing the problem of malnutrition.[5] Prevention of malnutrition is imperative, and thus growth-promotion activities are essential. Table 2.1 shows the strategy for overcoming some common causes of malnutrition.[6] Growth monitoring and promotion programmes have the potential to achieve improved breastfeeding and complementary feeding, which are two of the main child survival interventions, but this potential remains unfulfilled in many growth monitoring programmes. When considering growth monitoring programmes, three operational questions include: what age group should be included; how frequently should children attend; and should all children be monitored or just the most vulnerable?

Age group to be monitored

Recent data from 39 nationally representative surveys in developing countries indicate that mean weight falters between 3 and 15 months and length between 0 and 21 months of age. Thereafter mean weight and length increments follow international norms.[19] In Brazil, anthropometric status at 11 months of age was a very strong predictor of a child's status at 2 and 4 years.[2] Morbidity affects nutritional status largely in the first year, and poor feeding practices prevail until around 18 months of age. Focusing growth monitoring efforts on the first 12–18 months of life would thus seem appropriate. Growth monitoring could be stopped at 12 months for children with 1 episode of faltering in the first year. The time gained by not monitoring older children could then be used to provide better nutrition counselling services.

Frequency of measurements

The recommended interval is monthly, which enables early identification of faltering, but growth can occur in spurts and sporadic faltering is normal so criteria for faltering needs to be carefully defined to minimize false positives.[19,20] Local circumstances and resources are best taken into account when determining the frequency of monitoring.[2] If growth monitoring is combined with other services such as immunization, then the burden on caregivers is reduced and regular attendance may become more feasible. Sufficient staff and time, however, need to be provided at combined sessions to permit adequate counselling.[23]

Targeted or universal monitoring

The WHO group proposed that targeting children in the lower portion of the weight distribution at 6 months could be used to identify high-risk children.[3] They found that in Bangladesh and St Lucia, weight at 9, 12, 15 and 18 months of age was more highly correlated with weight at 6 months than with the previous 3-month weight gain. In St Lucia, the correlation coefficient between weight at 6 months and weight at 18 months was 0.79.

Most children in the study populations, however, were not exclusively breastfed so there was an opportunity for the consequences of poor feeding or contaminated environments to be manifest by 6 months of age. This would not be so in communities where infants are exclusively breastfed for 6 months, so the age for identifying high-risk children might need to be later in such communities.

Roberfroid et al have proposed that routine weighing should be confined to low birth weight infants and sick infants presenting at clinic.[19] They came to this conclusion because in their birth cohort of 2210 Kenyan babies, neither attained weight at 6 weeks nor rate of weight gain from birth to 6 weeks, or gain between 6 and 10 weeks was a good predictor of illness episodes or death in the subsequent 4–8 weeks. This targeted pragmatic approach did not perform any better than weighing all children, but it involved 72% fewer weighing, it so took less staff time. The cohort was not studied beyond 14 weeks of age and nutrition counselling was provided only if staff were available, so the findings cannot be extrapolated to later infancy when faltering may be more likely.

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Table 2.1: Strategy for overcoming some common causes of malnutrition[6]

CAUSES	POSSIBLE INTERVENTION	AGENCIES/MINISTER
adequate DietaryInstate	Improved food production & consumption Exclusive Breast feedings of all infants 0-6 months Introduction of Nutritious Complementary feeds from 6 months Regular monitoring of growth (CMP) Identification and prompt treatment of illnesses	Agriculture Health Education NGOS Information
Disease	Oral Rehydration Therapy Immunization against major childhood diseases Continual feeding during illness Increased Health Education & communication	Health Information NGOs CBOs Education
Household food Insecurity	Increased food security at family levels Income generating activities Improved agriculture production at local level Nutrition education	Agric Home Economics Education & information NGOs, CBOs.
Inadequate care ofWomen and children	Improvement of key Household Practices (KHHP) by families & communities Female empowerment through Education and income generation activities	Education Information NGOS Women Affairs

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study area is in Kakuri town in Kaduna State, Nigeria, situated between Latitude 10.5° and Longitude 7.4° covering a landmass of 59km^2. It is a suburban settlement with an estimated population of 100,000 people and about 55% are low income earners working either in the formal or informal sector while 25% of the population are not employed. The study location is Dr Gwamna Awan General Hospital, a secondary health facility owned by the state government. It started as a community hospital in 1978 and was inaugurated as Dr Gwamna Awan General Hospital in 2002.

Its catchment area is Kakuri town but extends to accommodate population from neighbouring Makera and Nassarawa communities and has a patient flow of approximately 323 patients daily (almost 7.7% of that figure represents under-five children). The area's malnutrition was calculated using hospital-based data and found to be 8.6% of the under-fives.

The hospital, in addition to rendering all secondary health care services, also caters for HIV patients through partnership with NGOs. The paediatric department has 3 doctors, 8 nurses, and 2 community health extension workers. It comprises daily out-patient, in-patient, bi-weekly neonatal, immunization, health talk, nutrition, follow-up units as well as a Center for Integrated Health Programme (CIHP) previously known as Integrated Center for AIDS and treatment Programme (ICAP) for HIV exposed children where the

only form of growth monitoring takes place.Daily patient flow was an average of 45 children between the ages of 0 to 15 years.

3.2 Study Design

The study was carried out on mothers/caregivers of under-fives attending the health facility within a period of three weeks using a descriptive cross-sectional study design.

3.3 Study Population

The study population consisted of mothers/caregivers of under-fives within the reproductive age group (15- 49 years) that brought their children for any child health service at the Dr Gwamna Awan General Hospital during the period of the study in October 2012.

3.4 Eligibility Criteria

The inclusion criteria for mothers/caregivers who participated in this study were:

1. Mothers/caregivers of under-fives that brought their under-five children to Dr Gwamna Awan General Hospital for health care services, child welfare & immunization.
2. Mothers & caregivers of under-fives who consented to the study.

The exclusion criteria were:

1. Men were not allowed to participate in this study.
2. Mothers/caregivers whose children were very ill requiring referral for admission.
3. Mothers/caregivers with children undergoing resuscitation and on admission.

4. Mothers/caregivers of under-fives who came for their personal health care services like ante natal, child spacing services and obstetric ultrasound scanning.
5. Mothers/caregivers of children above five years
6. Mothers/caregivers who did not consent to be recruited in the study

3.5 Sample Size

The appropriate sample size for a population-based survey is determined largely by three factors:

i. The estimated prevalence of the variable of interest – mother's knowledge of growth monitoring in this instance,
ii. The desired level of confidence and the acceptable margin of error.

Based on a previous study, the prevalence of mother's knowledge of growth monitoring was 54%.[27]Therefore, the minimum sample size of the study with a 5% margin of error and 95% confidence interval was calculated using the following steps:

$$\mathbf{n} = \frac{\mathbf{t^2 \times p(1-p)}}{\mathbf{m^2}}$$

Where,

n = required sample size

t = confidence level at 95% (standard value of 1.96)

p = estimated prevalence of mother's knowledge of growth monitoring in project area (54%)

m = margin of error at 5% (standard value of 0.05)

Therefore,

$$n = \frac{(1.96)^2 \times 0.54 \times 0.46}{(0.05)^2}$$

$$\frac{3.8416 \times 0.54 \times 0.46}{(0.05)^2}$$

$$= 381.701$$

$$\sim 382$$

Since the study population is <10, 000 the adjusted sample size is calculated using this formula:

nf = n/ {1 + (n/N)} i. e. $nf = \frac{n}{\{1+ (n/N)\}}$

Where:

nf = the desired sample size when population is less than 10,000

N = estimate of the population size (the entire number of mothers and caregivers of under five children that could possibly be included in the 3 week period of the study) = 2358.

n = the minimum sample size in population more than 10,000.

Hence:

$nf = \frac{382}{\{1+ (382/2358)\}}$

$nf = \frac{382}{\{1+ 0.162001696\}}$

$nf = \frac{382}{1.162001696}$

nf = 329

The minimum sample size nf was increased by 10% to take care of non-response.

The sample size therefore is (10% of 329) + 329 = 32.9 + 329 = 361.9 ≈ 360

Thus a total of 360 respondents were recruited for the study.

Daily Sample Size = 360/15 =24

Where 360 = total respondents to be recruited for the study

15 = number of working days of the duration of the study (3 weeks)

3.6 Sampling Technique

A simple random sampling technique was conducted in selecting the respondents. On each clinic day, eligible mothers/caregivers were identified in the morning after the health talk, before the start of consultation. To eliminate sampling bias as much as possible, balloting was used. Pieces of paper labeled ‘yes’ or ‘no’ squeezed and uniformly mixed were given to the eligible respondents to pick. Among those who satisfied the inclusion criteria, twenty-four mothers/caregivers who have picked ‘yes’ were selected and interviewed daily until the required sample size was reached.

3.7 Data Collection Tool

Data was collected using structured, interviewer administered questionnaire. The questionnaire comprised 5 sections, A-E (see in Appendix 1). In addition four (4) chart types showing different growth curve samples were used to assess respondents’ knowledge and interpretation of the growth curve (see Appendices 2-5).

These tools were pretested among 20 mothers/caregivers in Primary Health Care, Ungwar Rimi, a relatively comparative setting in Kaduna North Local government to determine the adequacy of the tool before finalization.

3.8 Data Collection Techniques

Data was collected by the researcher who was assisted by five (5) research assistants. The research assistants were trained on how to administer the questionnaire. The questionnaires were administered to the participants at the health facility just after the health talk usually while they waited for consultation. Each administration lasted between 8 to 15 minutes per participant. Confidentiality was assured by interviewing the women at a stand some distance away from the waiting area and conducted one at a time.

3.9 Quality Assurance

The following measures were adopted to ensure that results were accurate, reliable and reproducible:

- Engagement of qualified and experienced research assistants familiar with nutrition programmes.
- Use of the same type of questionnaire for all eligible respondents.
- Immediate evaluation of all administered questionnaires for discrepancies in information collected.
- Regular supportive supervision by the researcher to assistants

3.10 Survey management

The participants were well mobilized by involvement of health facility nutrition staff as mobilizers. Training was conducted for the research assistants and daily feedback

provided to the relevant health facility staff. Constant supportive supervision was given to the assistants and the time frame for interviewing a respondent was not exceeded.

3.11 Data Management

Data forms were checked for completeness, obvious errors and inconsistencies to identify any data quality errors. Data was entered using SPSS VERSION 20 computer software. Specific measures were taken to ensure that data entry was accurate. Validation of entered data was done using double data entry. Discrepant records were reviewed and corrected before data analysis commenced. Frequency tables were generated for all variables in order to further examine whether there were any unusual entries.

3.12 Data Analysis

Data obtained was subsequently imputed and analyzed electronically using SPSS software package, version 20. Variables analyzed included mothers' age, level of education, income status, parity, number of living children, awareness of growth monitoring procedures, knowledge of interpretation of road to health chart and attitudes towards and actual practice of growth monitoring. Data was presented using frequency and percentage tables and charts for all relevant variables were generated.

Correct interpretation of growth monitoring was made by determining the percentage of correct responses for each of the four chart types. A composite indicator was used to assess the knowledge of the mothers for each chart. Each score represented 10% of correct responses to one decimal place.

3.13 Information on Scoring and Grading

Scoring

Awareness of Growth Monitoring Procedures and Tools would be graded thus: Respondents' awareness of growth monitoring, their knowledge of interpretation of 'road to health chart'(Chart 1 – 4) and actual practices of growth monitoring are to be scored as follows:

Correct Answers for interpretation of chart:

Chart 1 shows – 1: Child is overweight

Chart 2 shows – 2: Child is gaining weight normally

Chart 3 shows – 3: Child is not gaining weight (Danger)

Chart 4 shows – 5: Childs weight is very dangerous

Correct answers for Practice

Q24 How regular should children between 0 and 1 year be weighed for GM?

Answer – 1: Once in a month

Q25 How regular should children between 1 and 2 years be weighed for GM?

Answer – 2: Once in two months

Q26 How regular should children between 2 and 5 years be weighed for GM?

Answer – 3: Two times a year

Q 38: Does this child have a growth chart? Answer – Yes

Q 39 Can I see the chart please? Answer – Available

Q 40 Who keeps the chart? Answer – The mother

Q 43 Can you weigh your child now? Answer – Yes

Q 45 Can you plot the weight of your child? Answer - Yes

A score of 1 is to be awarded to each correct response and a 0 score for a wrong one. To get their aggregate score we use the formula:

Aggregate Score = (Total correct score/ Highest possible correct score) x 100

Aggregated Score is to be graded thus:

Grading

Poor = % score0- 39%

Good = % score 40– 49

Very good % score 50-100

The respondents' attitude toward growth monitoring is to be graded based on Likert score.

p-value of < 0.05 would be considered as statistically significant.

The knowledge was scored as poor (0 to 3.9), fair (4.0 to 4.9) and good (5.0 to 10).

An assessment of the factors influencing knowledge of mothers on growth monitoring was made by cross tabulation of socio-demographic variables and the chances of either correctly interpreting all four chart types, three, two, one, or none at all. A p-value was calculated for each variable and a value of <0.05 was considered as statistically significant.

The attitude of the mothers/caregivers was determined by addition of the Likert score of responses for all variables examined to assess attitude. The response values for items

with reversed meaning were reversed to obtain a positive one-dimensional scaling before summing for the total.[28]

The practice of growth monitoring of the mothers was determined by computing the percentage of correct responses in relation to the wrong responses and how each of these scores fluctuated from one variable to another variable.

3.14 Ethical Consideration

Approval for the study was sought for from the management of Dr Gwamna Awan General Hospital, Kakuri, Kaduna. The essence of the study was discussed with the Medical Director and Matron-in-Charge.Verbal consent was obtained from each interested and eligible mother/caregiver. Those who were not conversant with English were communicated to in their local languages. The survey protocol ensured that no names were taken on the questionnaire. It was also ensured that the questionnaires were kept confidential. No eligible respondent received special treatment or favour more or less than the non-eligible respondents.

3.15 Limitations

The major limitation of this study was that the study area was an urban environment and had most of the study population to be at least literate from primary level and above. This meant that there were a high proportion of literate respondents compared to the illiterate ones. Hence the figures cannot be extrapolated to a rural environment.

CHAPTER FOUR

RESULTS

This chapter presents the result of the study. Interview was carried out among 374 respondents, 360 questionnaires were analyzed, errors and incomplete data invalidated the remainder.

The results analyzed were presented in tables and charts. They included socio-demographic characteristics of mothers/caregivers, child's information, number of mothers/caregivers that have heard of growth monitoring chart ,mothers'/caregivers' knowledge of purpose and familiarity with growth monitoring chart, reason for bringing child to the clinic on day of study, child's attendance for growth monitoring alone, number of mothers/caregivers who know how to correctly interpret the chart, relationship of socio-demographic characteristics to mothers'/caregivers' ability to correctly interpret the growth chart and mothers'/caregivers' perception of, attitude to and practice of growth monitoring.

4.1 Socio-Demographic Characteristics of Respondents

Table 4.1: Socio-Demographic Characteristics of Respondents (age, religion, marital status and education)

Demographic Characteristics	Frequency	Percentage	Mean	Standard deviation
Age				
15 to 24	156	43.3		
25 to 34	161	44.7	**26.03**	**1.63**
35 to 44	42	11.7		
45 +	1	0.3		
Religion				
Christianity	243	67.5		
Islam	117	32.5		
Marital status				
Single	27	7.5		
Married	327	90.8		
Divorced/Separated	4	1.1		
Widowed	2	0.6		
Education				
None	10	2.8		
Koranic	11	3.1		
Primary	62	17.2		
Secondary	162	42.0		
Tertiary	155	31.9		

The mean age of the mothers was 26.03 years (SD =1.63) and 44.7% of the women were in the 24 to 34 years age group. Majority of the mothers/caregivers were married (90.8%), and had at least a primary school education (94.1%) while 67.5%were Christians.

Table 4.2:Socio-Demographic Characteristics of Respondents (type of occupation and monthly income)

Demographic characteristics	**Frequency**	**Percentage**	**Mean**	**Standard deviation**
Type of occupation				
Unemployed	112	31.1		
Civil servants	40	11.1		
Secretary	40	11.1		
Petty traders	73	20.3		
Tailors	34	9.4		
Hair dressers	19	5.3		
Farmers	20	5.6		
Others	22	6.1		
Monthly Income (N)				
No income	112	1.1		
Below 31,000	183	50.8		
31,000 to 60,000	46	12.7	**14,951**	**7,120.54**
61,000 to 90,000	17	4.8		
91,000 to 105,000	2	0.6		

Table 4.2 shows that about a third of the respondents were unemployed and earned no income and about half of them earn below N31,000.

Table 4.3: Socio-Demographic Characteristics of Respondents (mother's parity and number of living children)

Demographic characteristics	Frequency	Percentage	Mean
Parity			**2.4**
1	103	28.6	
2	81	22.5	
3	95	26.4	
4 and above	81	22.5	
Number of living children			**2.2**
1	120	33.3	
2	97	26.9	
3	99	27.5	
4 and above	44	12.2	

Women who have had single delivery and those whose number of living children was one constituted the highest percentage of 28.6 and 33.3% respectively. Multi-parity of 4 and above and number of living children above of 4 and above constituted the lowest percentages of 22.5% and 12.2% respectively. The mean parity and number of living children were 2.4 and 2.2 respectively.

4.2 Information on Child's Attendance at Clinic

The table and chart below shows the age and sex distribution of the index children of the respondents interviewed.

Table 4.4: Age and sex distribution of the index children of the mother/caregivers.

Characteristics			Frequency	Percentage (%)	Mean	SD
	Sex					
Age (Months)	Male	Female				
0 to 11	96	153	249	69.2		
12 to 23	33	43	76	21.0		
24 to 35	9	12	21	5.8		
36 to 47	6	3	9	2.5		
48 to 59	4	1	5	1.4		
Total	148	212	360	100	11.0	9.9

Infants constituted 69.2% of the children of the respondents, only 1.4% of them were in the age group of 48 to 59 months. At ages 0 to 35 months, the male-female ratio was 2:3, but this ratio was reversed at 36 months where it became 3:2. The mean age was 11.0 months and the standard deviation was 9.9 months.

Table 4.5: Reason for bringing child to clinic on day of study

Reasons	Frequency	Percentage (%)
Treatment for ill health	165	45.8
For immunization	137	38.1
For Follow up	41	11.4
To attend Child welfare clinic	7	1.9
To attend Nutrition clinic	10	2.8
Total	360	100

From Table 4.5, curative services (treatment for ill health and follow up) constituted 57.2% of the reasons for bringing child to clinic on day of study while the preventive services (immunization, child welfare and nutrition clinic) constituted 42.8%. Ill health was given as the commonest reason for bringing child to the clinic (45.8%) whereas the only 2.8% of them were brought to the nutrition clinic. About a third (38.1%) indicated they brought their children for immunizations.

Table 4.6: Child attendance for growth monitoring alone

Response	Frequency	Percentage (%)
Yes	58	16.1
No	302	83.9
Total	360	100

As shown in the Table 4.6, only 16.1% of the children were brought to the health facility for growth monitoring alone.

4.3 Mothers'/Caregivers' Awareness and Knowledge of Growth Monitoring Procedure and Chart

Table 4.7: Mothers/caregivers that have heard of growth monitoring chart

Response	Frequency	Percentage (%)
Yes	137	38.1
No	223	61.9
Total	360	100

Table 4.7 shows that 61.9 % of mothers/caregivers have not heard of the growth monitoring chart before.

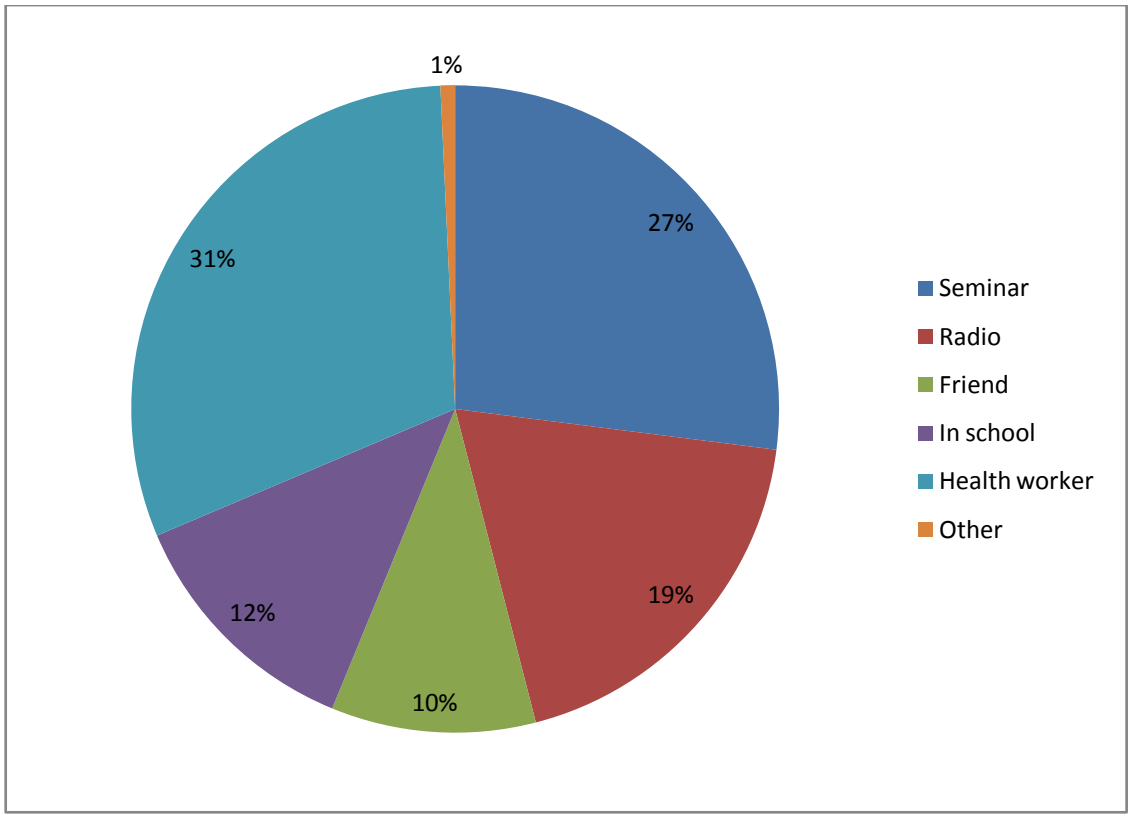


Figure 7: Mothers'/caregivers' source of information on growth monitoring chart (n = 137).

Figure 7 illustrates the percentage distribution of the sources of information of the respondents who have heard of the growth monitoring chat. A third of the respondents' source of information was from the health workers while organized forums in form of seminar and radio represent 46% of the total source of information for the respondents.

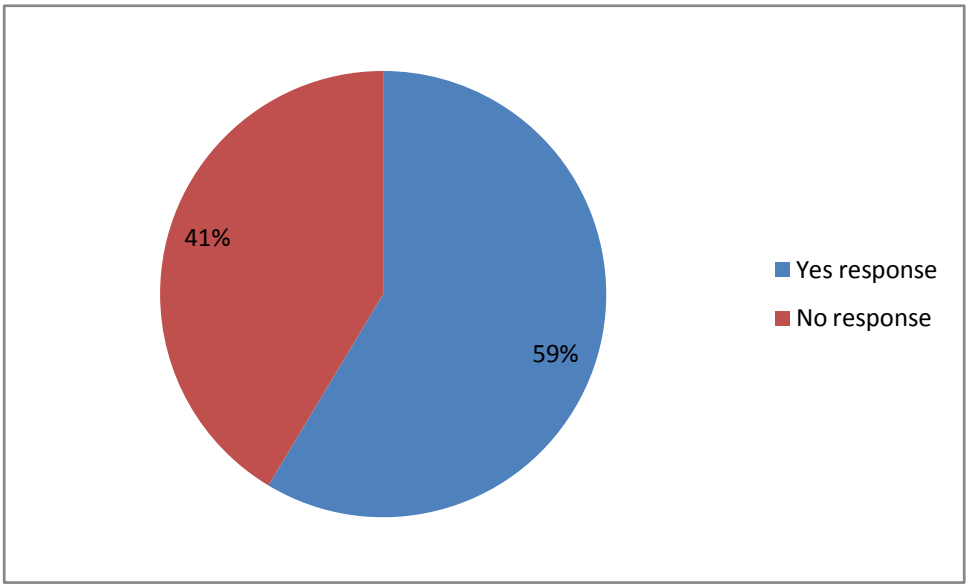


Figure 8: Proportion of mothers/caregivers that have seen growth monitoring chart

Figure 8shows that 59% (n=360) of the respondents had seen the growth chart before.

4.4 Mothers'/Caregivers' Knowledge on Purpose and Familiarity with Growth Monitoring Chart

Table 4.8: Mothers'/caregivers' knowledge on purpose and frequency of weighing

Variable	Correct responses	
	Frequency	Percentage (%)
Purpose of growth monitoring chart		
For monitoring the weight of the child	98	27.2
For immunization	73	20.3
Do not know	189	52.5
Frequency of weighing children by age group		
0 to 11 months	138	38.3
12 to 23 months	29	8.1
24 to 59 months	18	5.0

Respondents were asked the purpose of the growth monitoring chart. Only 27.2% correctly indicated weight monitoring as the main purpose of the growth chart. Overall mothers' score for the correct knowledge on the frequency of weighing infants in different age groups was also poor 38'3%, even though this was the highest for the age group 0- 12 months.

Table 4.9: Mothers'/caregivers' knowledge on information contained in growth monitoring chart

Information contained in growth monitoring chart	Correct responses	
	Frequency	Percentage (%)
Parents' Name	293	81.4
Parent's Home Address	293	81.4
Information about the Child	286	79.4
Information about the child's siblings, if any	231	64.2
Immunization record	278	77.2
Information child's breast feeding pattern	232	64.4
Information on how to interpret the child's growth curve	207	57.5
How to prepare ORS to treat diarrhea	218	60.6

Overall, respondents who had knowledge on information contained in growth monitoring chart were 57.5% - 81.4%. However the knowledge on information on how to interpret the child's growth curve was the lowest at 57.5%.

4.5 Mothers/Caregivers Who Know How to Correctly Interpret the Chart

Table 4.10: Percentage of mothers/caregivers that correctly interpreted the different growth chart

	Correct interpretations	
Description of Chart	**Frequency**	**Percentage (%)**
Chart 1: child is overweight	69	19.2
Chart 2: child with normal weight gain	86	23.9
Chart 3: child not gaining weight	66	18.3
Chart 4: child with dangerous weight	108	30.0

As shown in the Table 4.10, mothers/caregivers' ability to correctly interpret growth monitoring charts was generally very low, ranging from 18.3% for correct identification of growth chart showing a child not gaining weight to 30.0% for a child with a dangerous growth curve.

4.5 Relationship of Socio-demographic Characteristics and Mothers'/Caregivers' Ability to Correctly Interpret the Growth Chart

Table 4.11 below shows the relationship of some mothers/caregivers' socio-demographic variables with the knowledge on the correct interpretation of the growth chart. These variables include age, educational level, income status, parity and number of living children. The variables were shown against the frequency of correct responses for a total of 1, 2, 3 or all of the charts.

4.11: Socio-demographic characteristics and mothers'/caregivers' ability to correctly interpret the growth chart

Maternal Characteristics / CHARTS		No. of Mothers	CHART 1 (those who observed overweight gain trend)	CHART 2 (those who observed normal weight gain trend)	CHART 3 (those who observed no weight gain trend)	CHART 4 (those who observed dangerous weight trend)	P-Value (One way ANOVA)	P-Value (Two way ANOVA)
Age (years)	15-24	156	22	29	14	3	0.005	0.02
	25- 34	162	35	48	37	53		
	35+	42	12	9	15	22		
Level of Education	None	10	0	0	0	0	0.002	
	Koranic	11	1	0	0	2		
	Primary	62	6	14	3	3		
	Secondary	162	24	39	21	53		
	Tertiary	115	38	33	42	50		
Level of Income	No Income	112	23	21	22	25	0.007	
	Income Earner	248	46	65	44	83		
Parity	1	103	22	23	22	24	0.064	
	2	81	20	24	22	28		
	3	95	11	21	17	20		
	Above 4	81	16	18	5	20		
No. Living Children	1	120	25	32	23	33	0.0003	
	2	97	26	31	24	49		
	3	99	13	19	16	21		
	Above 4	64	5	4	3	7		

*Mothers who could not identify the chart type were excluded from the data analysis.

. The above data was analyzed using 1(one) way Analysis of Variance (ANOVA) to investigate the influence of each factor on the mothers' ability to interpret the chart.

A 2-way Analysis of Variance (ANOVA) was also carried out to see if all the factors combined together would yield a different influence on the interpretation of the chart.

From Table 4.11 it was observed that these factors significantly influenced respondents' correct interpretation of the growth charts: education, p-value=0.0001;number of living children, pvalue =0.0003; Age, p-value =0.0054 and level of income, p-value =0.0071. The 25-34 years age-group had the most numbers of mothers who correctly interpreted the charts. Parity had no significant influence on the mothers' knowledge of the growth charts interpretation with a p value of 0.0644. However from the 2-way analysis of variance, all the factors combined had a significant influence on the mothers' ability to correctly interpret the charts.

4.7 Mothers Perception of and Attitude to Growth Monitoring Chart

Using the Likert scaling, the mothers/caregivers' perception of and attitude to the growth monitoring chart was scored.

Table 4.12:Mothers'/caregivers' perception of and attitude to growth monitoring chart (Likert score)

Regular taking of the weight of a child is beneficial to its health				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	1	63	1 x 63	63
Disagree	2	9	2 x 9	18
Undecided	3	7	3 x 7	21
Agree	4	154	4 x 154	616
Strongly Agree	5	127	5 x 127	635
Growth monitoring is a waste of your time				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	5	155	5 x 155	775
Disagree	4	108	4 x 108	432
Undecided	3	1	3 x 1	3
Agree	2	81	2 x 81	162
Strongly Agree	1	15	1 x 15	15
Mothers of under-five children need to be able to interpret the growth chart				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	1	88	1 x 88	88
Disagree	2	58	2 x 58	116
Undecided	3	4	3 x 4	12
Agree	4	142	4 x 142	568
Strongly Agree	5	68	5 x 68	340
Only housewives need to monitor the growth of their children				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	5	152	1 x 152	760
Disagree	4	139	4 x 139	556
Undecided	3	16	3 x 16	48
Agree	2	26	2 x 26	52
Strongly Agree	1	27	1 x 27	27
Only mothers who can read and write should monitor the growth of their children				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	5	128	5 x 128	640
Disagree	4	181	4 x 181	724
Undecided	3	11	3 x 11	33
Agree	2	33	2 x 33	66
Strongly Agree	1	7	1 x 7	7
Only sick children need growth monitoring				
Variable	**Score**	**Frequency**	**SF**	**Total**
Strongly Disagree	5	153	5x153	765
Disagree	4	180	4x180	720
Undecided	3	9	3x9	27
Agree	2	16	2x16	32
Strongly Agree	1	2	1x2	2

Table 4.13: Mothers'/caregivers' perception of and attitude to growth monitoring chart. (Likert Scale Summary)*

Variable	**Strongly disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
	1	**2**	**3**	**4**	**5**
Regular taking of the weight of a child is beneficial to its health	63	18	21	616	635
Growth Monitoring is a waste of your time	15	162	3	432	775
Mothers of under-five children need to be able to interpret the growth chart	88	116	12	568	340
Only housewives need to monitor the growth of their children	27	52	48	556	760
Only mothers who can read and write should monitor the growth of their children	7	33	33	724	640
Only sick children need growth monitoring	2	32	27	720	765
Total score	202	413	144	3616	3915
Percentage (%)	2.44	4.98	1.74	43.62	47.23

*The scores for negative statements were reversed to obtain a positive one-dimensional scaling.

The above table shows that mothers' perception of and attitude to growth monitoring chart and practice was good as indicated in their responses. A score of 90.85% was observed for positive responses, while 7.42% showed disagreement.

4.8 Practice of Growth Monitoring

Table 4.14: Practice of various components of growth monitoring

Variables	**Frequency**	**Percentage (%)**
Child owns a chart	244	67.8
Growth chart sighted	150	41.1
Mothers/caregivers keeps chart	233	64.7
Mothers/caregivers taught how to weigh child	137	38.1
Mothers/caregivers can weigh child now	104	28.9
Mothers/caregivers taught how to plot the weight on the chart	64	17.8
Mothers/caregivers can plot the weight of child on the chart	49	13.6
Mothers/caregivers have been told how to interpret the plotted weight	69	19.2
Mothers/caregivers have been advised to always bring card along whenever coming to any clinic	166	46.1
Mothers/caregivers been advised to always bring card along whenever coming for immunization clinic	308	85.6

Evaluating the practice of various components of growth monitoring in Table 4.14, the least measure observed was noticed in ability to plot the weight at 13.6%, followed by being taught how to plot the weight on the chart at 17.8%. The practice most encouraged was that of bringing the card along whenever coming for immunization clinic with 85% of the respondents giving a positive response. Growth monitoring component mostly practiced by mothers was child's ownership of growth charts and keeping same by them at 67.8% and 64.7% respectively.

CHAPTER FIVE

DISCUSSION

The results observed raised a few issues. The mothers/caregivers appreciated growth monitoring as a good child health care and survival program, and were willing to identify with it but do not have adequate knowledge to practice it themselves. Some of the growth charts used during the study which were available in the hospital had some scaling and printing issues. The numbers on the weight axis (y axis) were not placed according to the mark. The two reference lines were not appropriately positioned. Some cards had higher reference lines starting way above the normal range (2.5-4.0 kg) of birth weight of a child (see Appendix 6).

5.1 Mothers'/caregivers' awareness on growth monitoring chart

Growth charts are recommended for monitoring a child's growth.It is a tool for preventing malnutrition in the under fives. It was observed in this study that mothers' awareness of growth chart was poor. Overall 38.1% of the mothers had heard of growth chart. This did not necessarily imply that they didn't have access to the charts. Most of the mothers/caregivers use the card for immunization purposes only, also the nomenclature of the card bears 'child health card' and not 'growth chart'; consequently it was discovered that most of them were unaware that the growth chart is on the reverse side of the immunization card. This is corroborrated by a study of 100 Bangladeshi mothers where 36% of them had any form of awareness of growth chart.[29] However, over half of 518 women (53.7%) in a study in Ilorin semi-urban Nigeria community had heard of growth monitoring chart.[27]

Generally, the more mother/caregivers are aware of the growth chart, especially as an integral tool of the growth monitoring program, the more they are able to seek avenues to understand it so that their children can enjoy the benefits such as early warning signs and response to malnutrition.[30]

Overall in this study, over half 59.0% of the mothers had seen growth monitoring chart. This is not as good as what the finding was in a USA internet based survey where 79% of parents surveyed claimed to have seen a growth chart before.[37]

A third (31%) of the respondents who had heard of growth charts had their source of information from health workers. Other sources included seminars, radio and friends. This was also the conclusion of a Lesotho study where it was observed that clinics group nutrition education, even when not integrated with growth monitoring, was responsible for the positive association between clinic attendance and maternal knowledge.[31]Also, R.C. Ibekwe et al showed how health workers were virtually the only source of information about growth chart for the mothers (90.3 %).[36]

The hospital being a major source of information could increase the chances of the mothers/caregivers awareness of the program and commitment to practicing it – it is like hearing from the horse's mouth. In addition, mothers/caregivers were less likely to discuss the chart with their friends or neighbours, as only 10% of the mothers said they heard of it from their friends. This could imply that, they are not enthusiastic about the growth chart or that they don't know enough to discuss it.

5.2 Mothers'/Caregivers' Knowledge of Growth Monitoring Chart

The mothers' knowledge about the information contained in growth chart was good generally. Overall respondents who had knowledge on information contained in growth monitoring chart were 57.5% - 81.4%. However the knowledge on information on how to interpret the child's growth curve was the lowest at 57.5%.

The mothers' ability to correctly interpret the charts was poor. After showing them four (4) different samples of growth curves, not more than 30% (in any category of the curves) of the respondents were able to correctly interpret the growth curves (see Table 4.10). For all the chart categories, over 55% of the mothers admitted that they didn't know what the curves meant. This is similar to a study by Masondo in Durban which found that mothers could not interpret the growth patterns in the Road to Health Card.[33]

Respondents' poor knowledge was reflected in their responses to what the major purpose of growth monitoring chart was for, as 27.2% of the respondents correctly answered that it is for monitoring the growth of the child; while more of them 36.9% indicated that the chart was mainly for immunization. On the other hand, a study in a semi- urban Nigerian community, 22.3% found the growth chart useful for all these: immunization record, nutrition advice, clinic appointment dates, and assessment of developmental milestones.[27]

Furthermore, this study found that the percentage of mothers who indicated knowledge of weighing a child was poor at 28.9%, so also for those who can plot the weight on the chart (13.6%). However this could be attributed to how much knowledge was imparted on mothers by health workers. In this study it was found out that, overall mothers that were taught how to weigh their children were 38.1%, those that were taught how to plot

the weight on the chart were 17.8% while those that were taught how to interpret the plotted curves19.2%. Unlike a study in an Ilorin Nigeria where the health workers, demonstrated a clear understanding of weighing, plotting, and interpretation of the chart, and even gave appropriate advice to mothers.[27]

Another study by Masondo in South Africa, revealed that mothers were not given accurate information about the growth parameters of their children, especially with regard to the Road to Health Chart.[33]

5.3 Mothers'/caregivers' attitude to, perception of, and commitment to the growth monitoring program and chart

Mothers' attitude to and perception of the growth monitoring process was generally good. Their good perception and attitude was reflected by 89.33% agreement to the statements in the Likert analysis. However, this was not reflected in their commitment to and practice of growth monitoring exercise and chart.

Mothers' poor commitment was also reflected in their attendance for growth monitoring alone (16.1%) and the frequency of weighing their children in relation to their age groups was generally poor. The highest 38.3% was noticed in the age group 0-11months. This was likely so because most childhood immunizations are received during this period.

Mothers' commitment to growth monitoring services and their practical use of growth monitoring chart was poor. Though the respondents who were in custody of their children's charts were 64.7%, however 41.1% of them brought their charts to the clinic on the day of study (charts sighted).This is similar to a finding in a study by Masondo where the mothers were aware that they were supposed to carry the Road to Health Card

each time they visited the clinic, but did not carry these cards as required stating the reasons that the children were not weighed when they attended minor ailment clinics and that the health workers did not ask for the Road to Health Cards during these visits.[33]

It was observed that having seen or owning a growth chart did not guarantee the respondent's ability to weigh, plot or interpret it. Consequently these practices of growth monitoring were observed to be poor. Mothers who indicated they can weigh their children were 28.9%, those who can plot the weight were 13.6%.

However these observations could have been better if mothers were adequately taught how to do these things. For instance 38.1% of them had ever been taught how to weigh their children; 17.8% had ever been taught how to plot the weight, while 19.2% had ever been taught how to interpret the plotted weight.

5.4 Mothers' ability to interpret curves on the growth chart

Mothers' ability to interpret of curves on the growth chart was poor. In this study it was found out that respondents' scores for chart 1(child is overweight) was 19.2%, chart 2(normal weight gain showed as a rising curve) was 23.9%, chart3 (no weight gain- flat curve) was 18.3% and for chart 4(child' weight is dangerous- falling curve) was 30%.

This is contrary to a study done in a Primary health care center in Jos: for chart 2 (normal weight gain) was 40.6%, chart 3 (no weight gain) was 37.2% and chart 4 (weight being dangerous) was 45.3%.[38]Also a study in Ilorin Nigeria of 174 mothers, it

was observed that 33.6% of them demonstrated an understanding of the markings on the chart.[27]

5.5 Mothers' characteristics that influence the correct interpretation of the growth curves

In this study, age, education status, occupation status, monthly income, parity & number of living children were cross tabulated with correct interpretation of growth monitoring curves. It was observed that mothers' knowledge to correctly interpret the growth charts was poor.

Age had an influence on growth monitoring practice of correct interpretation of growth monitoring curves p-value 0.0054. The level of knowledge of growth monitoring practices reduced among mothers/caregivers with increasing age (35+ years). Those within the age group 25 – 34yrs were able to interpret the charts better than all the other age groups (see Table 4.11). This observation can be tied to the average age a learned woman within the area of study began to have children (25years).

The ability to interpret the growth curve was significantly influenced by mothers' level of education p value= 0.0001. Mothers who had at least primary school education demonstrated a better ability to interpret the growth charts. It was observed that the more educated the mothers were the better their ability to interpret the growth curves.

No illiterate mother interpreted any of the charts correctly. This was also observed in a study carried out by Adhikary (2011) who concluded that very few Bangladeshi rural mothers understood the growth chart and the implication of the data they present.[29]

Level of education being an influence on the mothers' ability to correctly interpret the growth curve was also observed by Manouri et al (1997) in a Sri Lankan study of maternal comprehension of two growth charts which found that education up to or beyond grade 8 (Junior Secondary School 2) significantly improved comprehension.[32] Also, Adhikary (2011) found that none of the illiterate mothers among the 100 that responded to a survey had "good knowledge" of the growth chart. Graphs are common figures people come across in school; it is easier to define curves on them in terms of rising, and falling slopes if one has come across graphs before.[29]

In this study, level of income also significantly influenced mothers' ability to correctly interpret the growth curve, p-value of (0.0071). Income earners interpreted all the 4 curves better than the no income earners. They interpreted chart 4 correctly better than other charts, (76.8%). Number of Living Children also significantly influenced mothers' ability to correctly interpret the growth curve, p-value of 0.0003. Parity had no influence on mothers' ability to correctly interpret the growth chart, p-value of 0.0644). This could be as a result of waning interest and non- commitment to the practice as the number of children increased. Mothers with parity of 2 had the highest correct interpretation of the charts; highest at 37.3% (chart 4) and mothers with parity of 4 had the least values for all the chart types.

Efforts to improve mothers/caregivers' knowledge on the growth monitoring practices (comprising regular weighing of the child, plotting the chart, interpreting the growth curve and seeking for intervention where necessary) should involve programs and activities such as community and facility-based health talks, individual versus group

counselling, and initiation and integration of community-based nutrition programmes that will encourage them to play major roles in monitoring the growth of their children.

As they practice what they are taught, they become versed in it and will soon start teaching new mothers around them. This can only be achieved if the health workers are trained specially for the exercise and encouraged to take the exercise much more seriously. Such efforts should also aim at making the chart easily comprehensible for mothers no matter their age, level of education and literacy.

5.6 Conclusion

Mothers did not comprehend the growth chart. Mothers'/caregivers' knowledge of the process & practice of growth monitoring using the growth chart was poor. They tended to confuse the growth monitoring program with the immunization exercise. They however had a good perception of and good attitude to growth monitoring as being beneficial to their children, but had a poor commitment to the growth monitoring chart and consequently the practice of growth monitoring.

Mothers' ability to correctly interpret the growth curve was poor; not more than 30% (in each category of growth curve sample) of the mothers/caregivers could correctly interpret the growth curves. Growth monitoring services were poorly attended to by them; they demand for more curative and immunization services than the promotive/ preventive aspect of medical care. Respondents regularly attended the clinics only within the first year of the child's life on account of immunization, subsequently these

visits reduce and so does the practice of growth monitoring. This is probably because health workers are poorly trained and growth monitoring is not well promoted.

Age, educational level, level of income and number of living children significantly influenced the respondents' correct interpretation of growth monitoring chart, while parity had no significant influence.

5.7 Recommendation

1. More emphasis should be on the involvement of mothers/caregivers to practice growth monitoring and interpretation of growth chart.

2. Since mothers are more likely to hear of growth chart/ monitoring from the health workers, the latter should be trained further on growth monitoring, plotting the chart correctly, correct interpretation of the plotted curves, and appropriate advice for early interventions when abnormal growth curves are noticed.

3. Functional primary healthcare centres (PHCs) should be established in communities all over the country.

4. The health workers should create awareness for the mothers on the relevant information on the card especially the growth curve pattern.

5. Hospital administrators should ensure that the cards used are properly labelled and correctly scaled. This will enhance comprehension, appropriate charting and the effectiveness of the chart as a tool for monitoring the growth of a child.

6. Awareness and sensitization should be carried out in the mass media about growth monitoring and its importance by the Ministry of health.

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Appendix 1: Questionnaire

COMMUNITY MEDICINE DEPARTMENT AHMADU BELLO UNIVERSITY ZARIA

MPH THESIS QUESTIONNAIRE

ASSESSMENT OF MOTHERS' KNOWLEDGE ON GROWTH MONITORING CHART OF THEIR CHILDREN IN DR GWAMNA AWAN GENERAL HOSPITAL KAKURI, KADUNA-KADUNA STATE

Serial No: _____

A. **Introduction**

I am an MPH student of Ahmadu Bello University (ABU) Zaria, undertaking my thesis on *Assessment of Mothers' Knowledge on Growth Monitoring Chart of Their Children* in Dr Gwamna Awan General Hospital Kakuri, Kaduna State. This questionnaire is the major means of collecting data for the work and the information to be drawn from it is to be used for the research purpose only. Although your response is essential to the success of the study, the participation is purely voluntary and confidentiality is to be maintained. Thanks for your anticipated cooperation.

Instruction: Fill in the gap and circle the correct option where appropriate

I. Mother/Father/Child's Socio-demographic Information

(I) Mother's Information

1. What was your age as at your last birth date? _____
2. What religion do you practice

1. Christianity
2. Islam
3. African traditional religion
4. Others _____

3. Are you…..
    1. Married?
    2. Single?
    3. Divorced?
    4. Separated/Widowed?

4. What is your highest level of education?
    1. Primary
    2. Secondary
    3. Tertiary
    4. Quranic
    5. Informal
    6. Other (specify) _____
    7. None

5. Can you read and write in
    1. English?
    2. Anjami?
    3. Hausa?
    4. Any other language, Yes ( ) No ( )

6. Are you doing any work to earn an income? Yes ( ) No ( )

   1. If yes, what work are you doing? _____

   2. How much do you earn in a month? Averagely _____

7. How many deliveries have you had? ( )

8. Of these deliveries, how many were live births ( )

9. How many are still alive ( )

(II) Father's Information:

10. What is the highest level of education of the child's father?

    1. Primary

    2. Secondary

    3. Tertiary

    4. Quranic

    5. None

11. Can he read and write in:

    1. English?

    2. Anjami?

    3. Hausa?

    4. Any other language Yes ( ) No ( ).

12. Is the father of this child working? Yes ( ) No ( )

13. If yes, what work does he do? _____

14. What is his monthly income? _____

(III) Child's Information

15. How old is this child? _____ (Age in months)

16. What is your child's sex? Female ( ) Male ( )

17. What is the reason for your bringing the child to the clinic today?

    1. Ill health
    2. Immunization
    3. Follow up
    4. Child welfare clinic – growth monitoring
    5. Nutrition clinic

18. Have you ever brought this child for growth monitoring alone?Yes

( ) No ( )

B. Awareness and Knowledge of Growth Monitoring Procedures and Charts

19. Have you heard of the growth chart?

    Yes ( ) No ( )

20. If yes, what is the source of your information?

    1. Seminar/workshop
    2. Radio
    3 Friend
    4. In School
    5. Health Worker
    6. Others _____

21. Have you heard of immunization card before?

    Yes ( ) No ( )

22. Have you seen the growth chart before?

Yes ( ) No ( )

23. What is the main purpose of the growth chart?

1. For immunization

2. For monitoring the weight of the child

3. Don't know

24. How regular should children between 0 and 1 year be weighed for growth monitoring?

1. Once in a month

2. Once in two months

3. Two times a year

4. Don't know

5. Whenever the child is broughtfor immunization or illness

25. How regular should children between 1 and 2 years be weighed for growth monitoring?

1. Once in a month
2. Once in two months
3. Two times a year
4. Don't know
5. Whenever the child is broughtfor immunization or illness

26. How regularly should children between 2 and 5 years be weighed for growth monitoring?

1. Once in a month
2. Once in two months

3. Two times a year

4. Don't know

5. Whenever the child is brought for immunization or illness

27. Are you aware that the following items are information that are recorded on a growth chart?

1. Parent's names Yes ( ) No ( )

2. Parents' home address Yes ( ) No ( )

3. Information about the child Yes ( ) No ( )

4. Information about the child's siblings if any Yes ( ) No ( )

5. Immunization records Yes ( ) No ( )

6. Information about breast feeding Yes ( ) No ( )

7. Information on how to interpret the child's growth curve Yes ( ) No ( )

8. How to prepare oral rehydration solution to treat diarrhoea Yes ( ) No ( )

C. Mothers' knowledge of interpretation of Road-to-Health Chart

The interviewer's instruction: (shows the 4 different charts, one after the other, with weight measures for a period of 6 months connected together), for mothers to interpret & then ask each mother these questions.

What is the interpretation of the following?

28. Show chart 1 (which shows a child with over nutrition). What do you understand about this curve (plotted child's weight for 6months' period) on the chart; above the upper reference curve?

1. Child is overweight

2. Child is underweight

3. Child is gaining weight normally

4. I don't know

29. Show chart 2 (which show a child's plotted weights within the upper & lower reference curves & on the upward trend).

What do you understand about this curve (plotted child's weight) on this chart?

1. Child is underweight
2. Child is gaining weight normally 
3. Child's growth is in danger
4. I don't know

30. Show Chart 3(which shows child with static weight, though within the reference curves).

What do you understand about this curve?

1. Child is gaining weight too much 
2. Child is growing normally
3. Child is not gaining weight- weight remains the same for months
4. I don't know

31. Show chart 4(which shows a child with severe malnutrition, on the downward trend below the lower reference point).

What do you understand about the curve on this chart, in relation to the child's health?

1. Child is gaining weight too much
2. Child is growing normally
3. Childs' weight is the same for months
4. I don't know

5. Child is grossly underweight

D. Attitudes of Respondents toward Growth Monitoring (GM)

32. Regular taking of the weight of a child is beneficial to his health

    1. Strongly Disagree
    2. Disagree
    3. Undecided
    4. Agree
    5. Strongly Agree

33. Growth monitoring is a waste of your time

    1. Strongly Disagree
    2. Disagree
    3. Undecided
    4. Agree
    5. Strongly Agree

34. Mothers of under-five children need to be able to interpret the growth chart

    1. Strongly Disagree
    2. Disagree
    3. Undecided
    4. Agree
    5. Strongly Agree

35. Only housewives need to monitor the growth of their children

    1. Strongly disagree
    2. Disagree

3. Undecided

4. Agree

5. Strongly Agree

36. Only mothers who can read and write should monitor the growth of their children

1. Strongly Disagree

2. Disagree

3. Undecided

4. Agree

5. Strongly Agree

37. Only sick children need growth monitoring

1. Strongly disagree
2. Disagree
3. Undecided
4. Agree
5. Strongly agree

E. Respondents Practice of Growth Monitoring

38. Does this child have the type of card (growth chart) just shown to you?

Yes ( ) No ( )

39. Can I see the chart please?

1. Available

2. Not available

40. If yes, who keeps the growth chart?

    1. I, the mother

    2. I, the care giver

    3. The father

    4. The health worker

    5. Others _____

41. How many times has your child been weighed since the last 8 week? _____

42. Have you been taught how to weigh your child? Yes ( ) No ( )

43. If yes can you weigh your child now? Yes ( ) No ( )

44. Have you been taught how to plot the weight on the chart? Yes ( ) No ( )

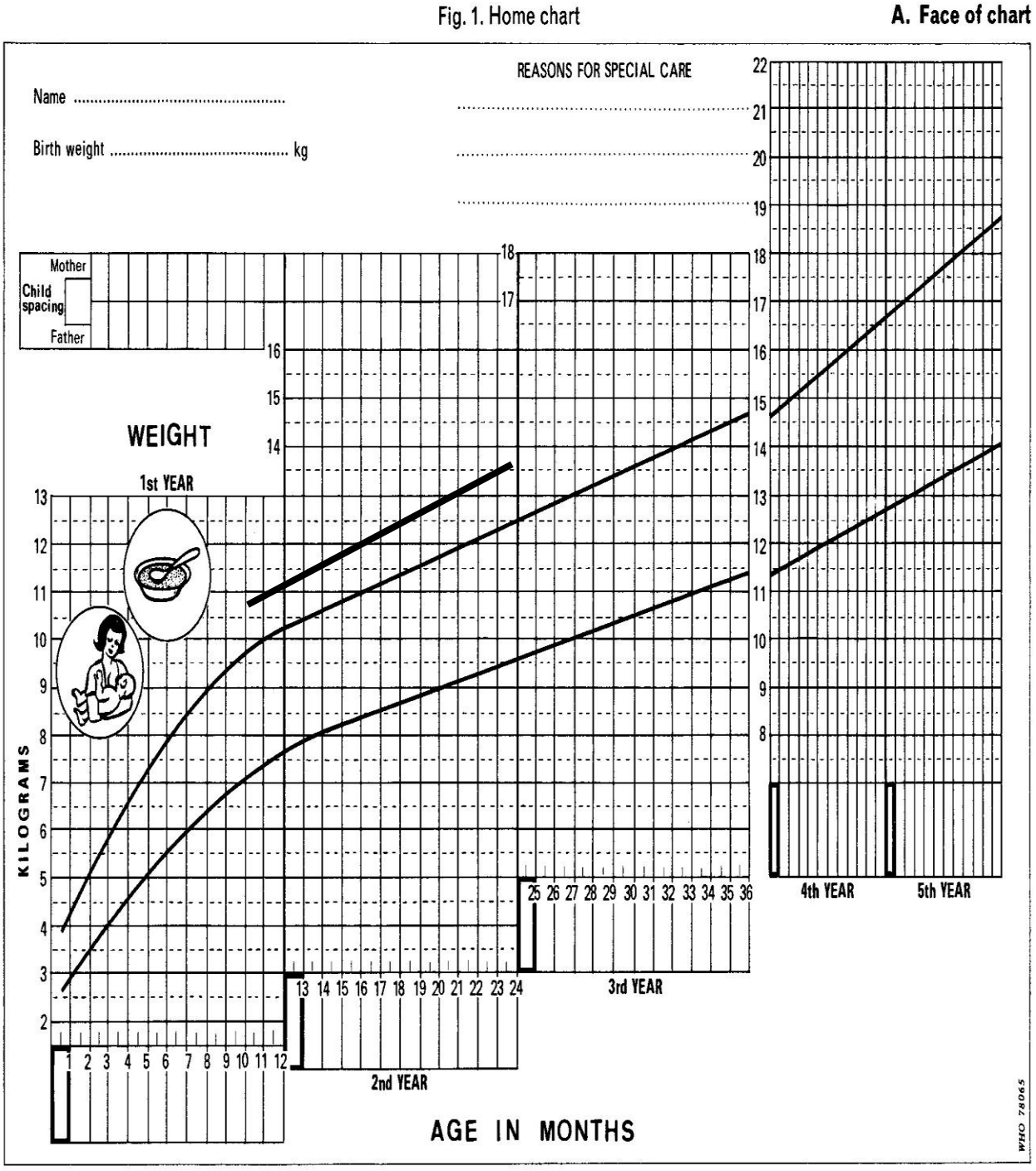
45. If yes, can you plot the weight of your child on the chart? Yes ( ) No ( )

46. Have you been told how to interpret the plotted weight? Yes ( ) No ( )

47. Have you ever been advised to always bring your card along whenever you are coming to any clinic? Yes ( ) No ( )

48. Have you ever been advised to always bring your card along whenever you are coming for immunization clinic? Yes ( )No ( )

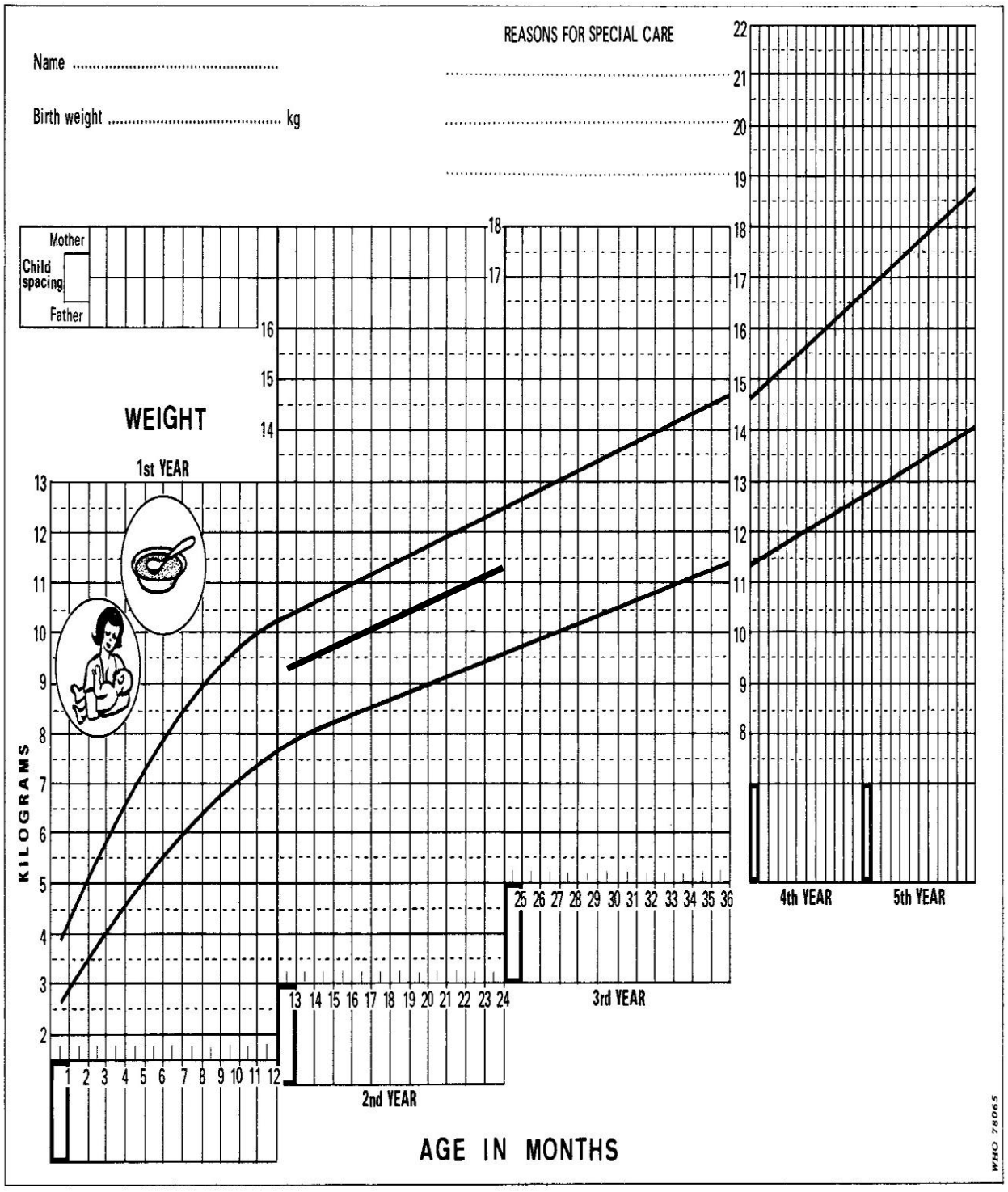
Appendix 2: Growth chart with curve above normal limits



Appendix 3: Growth chart with curve within normal limits

Fig. 1. Home chart

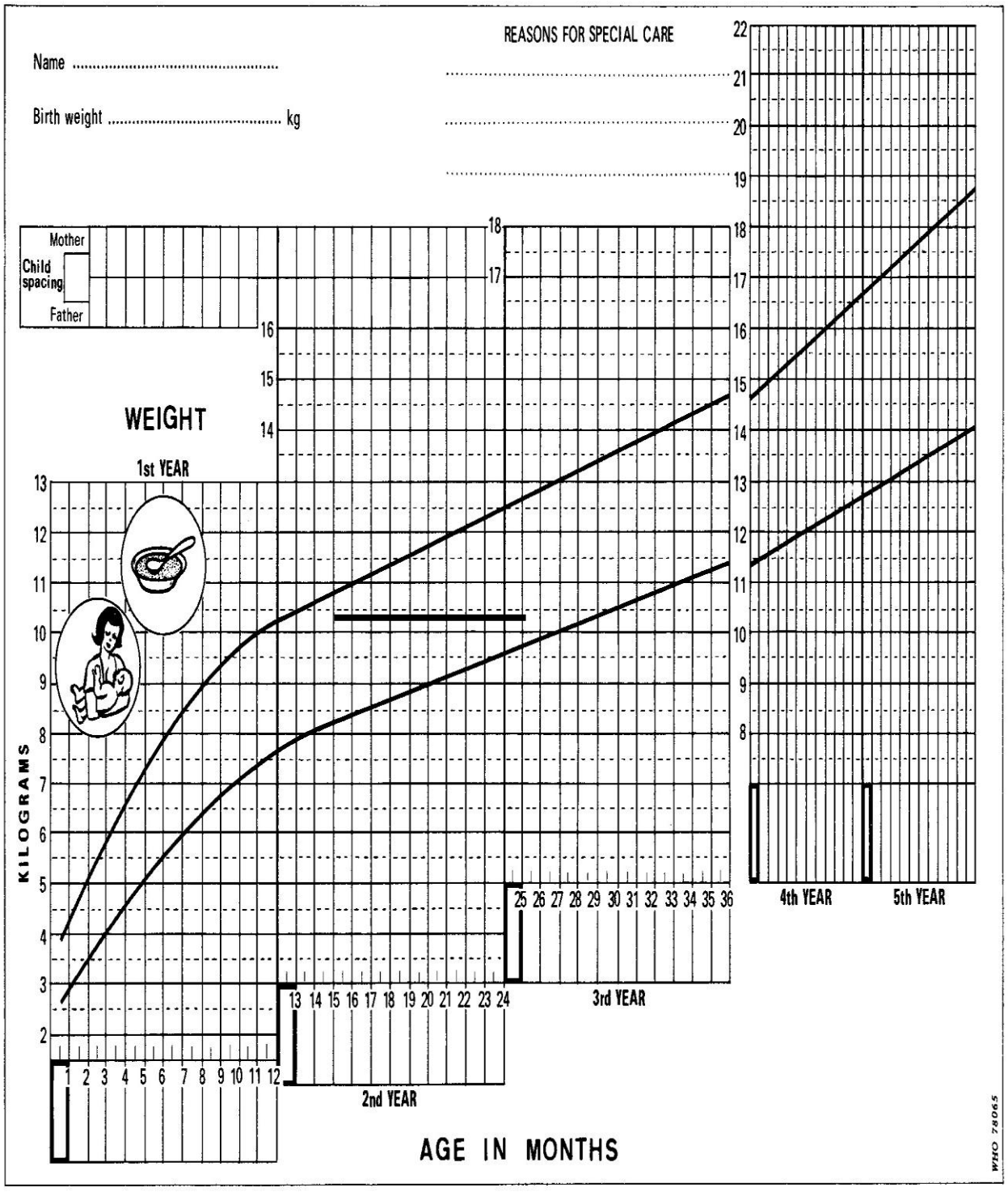
A. Face of chart



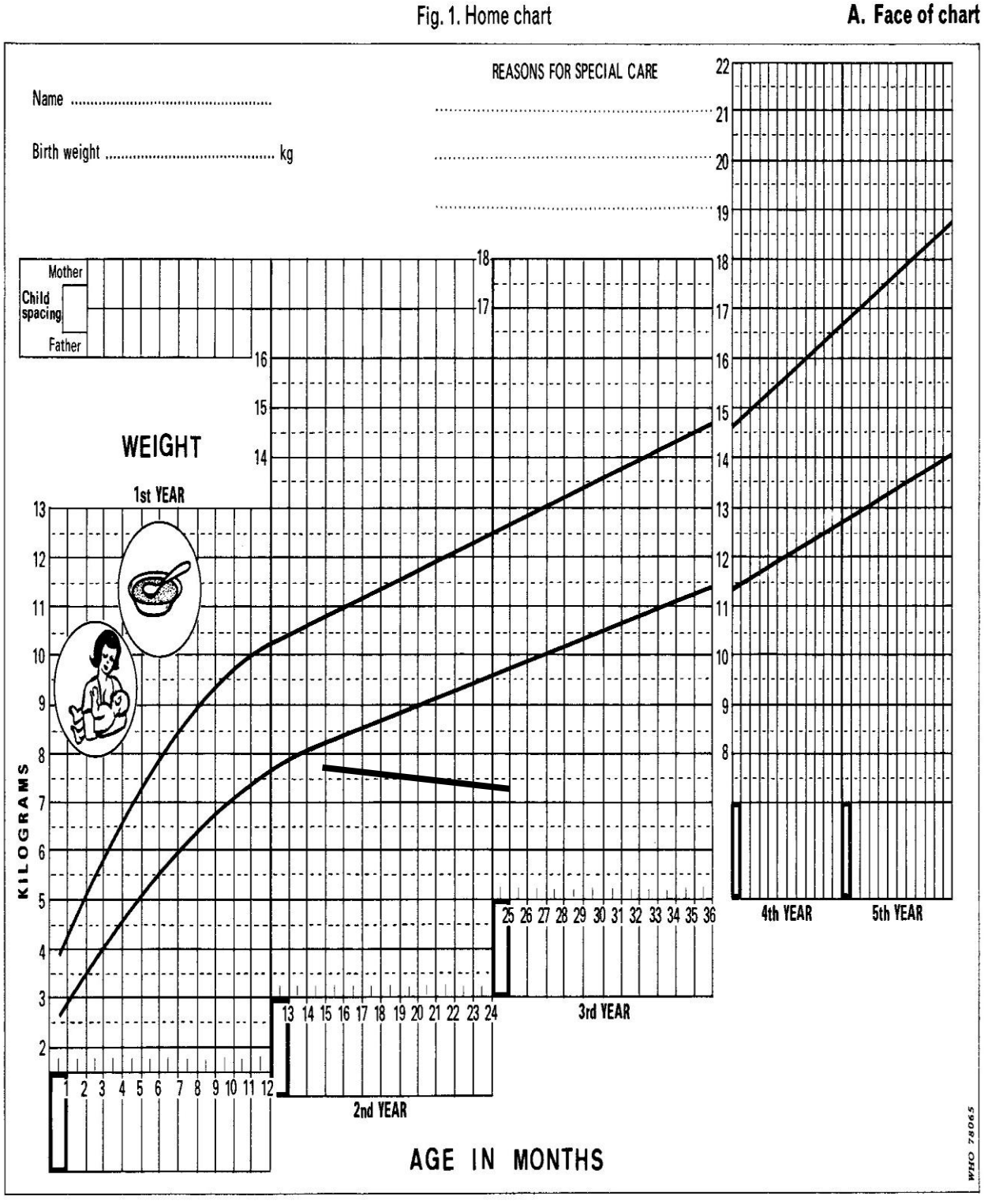
ppendix 4: Growth chart with curve static but within normal limits

Fig. 1. Home chart

A. Face of chart



Appendix 5: Growth chart with curve below normal limits



Appendix 6: Growth Chart with Printing and Scaling Errors

