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Poor Workers and Multidimensional Poverty in Sudan: An Empirical Analysis for the Case of Al-Hasaheisa Locality, 2023

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Abstract- Eradicating poverty is central role of the most nations worldwide. The link between workers and poverty is a critical way. This paper is set to investigate the persistence of multidimensional poverty among adult workers in Al-Hasaheisa Locality, following the Alkire-Foster model. The research relies on primary data aided by structured questionnaire compiled by Central Bureau of Statistics for year 2023, a total of (764) households headed by adult workers was interviewed, analysis of poverty decomposed by male/female workers and by urban/rural regions. The results indicated (43.62%) of the adult-workers are experience a multidimensional poverty and households headed by female-workers represent high level of deprivation (52.37%) than one headed by male-workers (46.49%). Moreover, households in rural areas are deprived more often than urban areas and the deprivation seems to be concentrated in all dimensions. The study concludes having a job is not enough to keep the workers out of poverty.

Keywords- Poor Workers; Poor Householders; Employment; Alkire-Foster Method; Sudan; Al-Hasaheisa Locality

I. Introduction

Eradicating poverty is central aims of the most nation-states in our world. Many societies have committed to ending poverty and poorness by 2030. Fighting extreme poverty and improving health and education are among the main Millennium Development Goals agreed by 189 heads of state in 2000. Since the seminal works of Sen, poverty is

accepted as multidimensional phenomena, although, multidimensional measurement is a more responsible and reliable alternative in most context [1]. The term of the multidimensionality of poverty arises into the ground due to limitations for individuals to define poverty, the limit on all aspects of life [2; 3; 4].

According to the Sustainable Development Goals (SDGs), poverty specifically mentioned as multidimensional feature [5], some methodologies has been developed to assess this problem, Alkire-Foster method is one example used worldwide [6] the method approved nationally by many organizations to calculated multidimensional poverty index (MPI) for different purposes to regions and sub- regions or to groups and sub-groups.

In order to addressing poverty in one nation, information on the characteristics of the population living in poverty is essential, when identifying the causes behind deprived them it become simple to pick them out of poverty. For instance, data on employed and unemployed can provide valuable insights into the factors prompting poverty, the term employed or in other word labour force associated with employed being adults and hence decent living for their families. Generally, the link between employment and low level of poverty only when the quality of the work is sufficient, understanding the relationship between employment and poverty is thus critical, nonetheless, unemployment and underemployment lies at the core of poverty.

For the poor, labour is often the only asset they can use to improve their well-being, especially for those who head their families. Henceforth the creation of productive employment opportunities is essential for achieving poverty reduction and sustainable economic and social development. It is crucial to provide decent jobs that both secure income and empowerment for the poor, especially women and younger people [7]. Since the World Summit on Social Development in1995 the notion of employment has been widely used as important tool in reducing poverty. Furthermore, full and productive employment and decent work for all, including for women and young people had become a central objective for most leaders of the world, for example, World Summit, 1995 & 2005, United Nations, 2005 and Economic and Social Council 2006 and another worldwide phenomenon is the rapid increase in the number of female householders (Gucciard, 2004).

Moreover, the definition of working poor are employed people who live in households that fall below an accepted poverty line. While poverty in the developed world is often associated with unemployment, the extreme poverty that exists throughout much of the developing world is largely a problem of employed persons in these societies. For these poor workers, the problem is typically one of employment quality. Reducing poverty in line with

the SDGs therefore necessitates boosting the employment opportunities and incomes of the working poor – those people who are employed, but who are nevertheless unable to lift themselves and their families above the poverty threshold [8], existence this condition more effort in this area is needed.

The most recent official estimates poverty in Sudan based on the 2014/2015 National Household Budget and Poverty Survey (NHBPS) [9]. Poverty in Sudan affected over a third of its population and 18.3% of the population of Gezira State, where this study rests, are poor. Moreover, the poverty gap ratio (depth) at 1.1% and the poverty gap (severity) at 2.7% [10]. Oxford poverty and human development initiative [11] assesses the national MPI for Sudan, the value is 0.279 and for Al Gezira State is 0.167. Figures of [8] labour force participation rate in Sudan is 49% of total population ages 15+, employment to population ratio 40% and unemployed 18.7% of total labour force.

The importance of this study comes from the stem that there is a big gap in adult workers and gender data, the lack of this data make difficulties in assessing the trend and monitor the direction and pace of progress for poverty reduction. Due to unavailability and in some context data is slightly lower, this study aims to reduce this gap. The present study has drawn to investigate the main features of economic and socio-economic situation of adult workers in Al-Hasaheisa Locality, and it will also contribute to abundance of literature on poverty reduction issues; the latter supposed to use as a guide to empower adults. The research tries to answer these questions: is employment a guarantee against poverty? What is the main contributor to adult workers' multidimensional poverty? Who are the most poorer male workers-head of households or female workers head-households? How unbalanced development leads to disparities among sub-regions (urban/rural)?

To measure multidimensional poverty, the present study introduces the Alkire-Foster measure that built on the Foster, Greer, and Thorbecke (FGT) index [12] to explain multidimensional poverty index (MPI) in Al-Hasaheisa Locality, it focuses mainly on multidimensional poverty among adult workers aged 25+ whom are head of their households. The justification to examine poverty from a multidimensional view is because poverty shows different shapes of deprivation in major principles of life, and it refers to pronounced deprivation in one or more facets of the well-being of a person. Furthermore, multidimensional methods offer another guide to explain poverty and how it can be viewed and understood [6].

Therefore, the main objective of this research is to calculate the MPI for adult workers (aged 25 and above) head of households in Al-Hasaheisa Locality based on primary data compiled by the Central Bureau of Statistics

(CBS) on poverty-related indicators for the year 2023. The specific objectives are: 1) to calculate the MPI by the two groups male-workers and female-workers. 2) to assess the contribution of factors to MPI. 3) to empirically analyze poverty decompositions by urban and rural location.

To do this the researcher is set to test the validity of the following working hypotheses: H1. Adult workers under the study area experiences multiple deprivations. H2. Having a job is not enough to keep the adult workers and their families out of poverty. H3. Female workers head-households are poorer than male workers head-households. H4. Population in rural areas are deprived more often than urban areas.

The remainder of this paper is organized as follows. Section 2 reviews background information on Sudan multidimensional poverty and employment. Section 3 state the methodology and describes the data and sample selection. Section 4 presents the empirical results, and dissection the conclusions and policy implications in Section 5.

II. Literature Review

Multidimensional poverty in Sudan

Sudan is the largest country in Africa with less than one million square miles after separation of the southern part in 2010. The Northern part of the country is an extension of Sahara Desert and the central part is a dry Savannah area tapering to a tropical forest climate in the junction with the northern boundaries with the southern country, is the largest countries in Africa, bordered by nine countries. The socio-economic condition in Sudan has changed dramatically during the past few decades, a study by [13] showed significant state and sub-groups dissimilarities in measuring multidimensional poverty in Sudan, [10] calculated the global poverty prevalence in the Sudan the figure at 36.1% about 25 percent of its population are extremely poor.

According to [11], the global MPI in Sudan is estimated at 0.279 and also computed by sub-region urban and rural which the figures stated at 0.122 and 0.351 respectively. Recent study on multidimensional poverty in Sudan conducted in 2021 by [14] used the multidimensional poverty approach to assess poverty in Gedaref State and found 47% of the population are multidimensional poor.

Employment

The formal sector is the main sector for employment. However, civil servants' earnings are very low. The civil service is organized into scales and grades. Each grade is assigned a salary scale, with incremental steps leading from a minimum salary to the maximum possible in that grade. The current salary structure is based on 17 grades, with the highest being G1 and the lowest permanent grade position being G14. Based on the pay scales that were in effect in March 2002, public employees at a G1 grade receive a basic salary and allowances equivalent to $61 per month. The lowest permanent grade position of G14 receives an equivalent amount of $25 [15].

Information on the size and employment structure in the informal sector is hard to obtain. Work in the informal sector usually involves high job insecurity, often in micro-scale self-employment or casual activities. Due to insufficient income, workers are often involved in multiple activities and jobs. Figures of [16] from the total population of Sudan, women account for nearly 50% of the population. Despite their active role in society, their socio-economic situation is still precarious. For decades they have remained marginalized both economically and socially, and sidelined in the political sphere.

In Sudan tend to be traditional, a man is the 'head' of the house as official leader. He is responsible for all financial aspects of family life. Customarily, the father makes all decisions regarding the family and may consult his brothers and brothers-in-law or other male family members. While women are considered subordinate family member, although this varies across tribes and locations [17].

With the pressure of domestic responsibilities and limited opportunities to meet employment, financing, and education, women are confined to particular occupations such as income generating activities. Families support each other financially and socially. Traditionally, families take care of their sick, old, and mentally ill members. female provide most of such family services and are also responsible for maintaining the home and raising the children. The majority of Sudanese household heads are males. However, 28% of households are headed by women, with the proportion being the highest in rural areas. The average household size in Sudan is approximately seven persons.

III. Methodology

The MPI concept

The agreement on poverty is multidimensional concept has been guided to many others researchers to develop the approach created by Alkire-Foster, this is approach is the most widely used worldwide [6] and applied, for example, the OPHI and the human development report office of the united nations development programme (UNDP) to calculate the MPI globally for comparable measure purposes from one hand, from another hand to help policy makers to reduce poverty.

Later, acute multidimensional poverty was computed for above 100 developing nations and updated annually. In a similar line, [18] also uses this method for its specific multidimensional poverty measures. In October 2018 World Bank launched its own method [19]. In addition, some countries have shaped national MPIs as official eternal poverty data, familiarizing the technique to their own situation and national concerns.

Aggregation stage

The MPI is composed of three dimensions made up of ten indicators, associated with each indicator is a minimum level of satisfaction, which is based on international consensus, such as the MDGs. This minimum level of satisfaction is called a deprivation cut-off. Two steps are then followed to calculate the MPI.

Step 1, each person is assessed based on household achievements to determine if he or she is below the deprivation cut-off in each indicator. A person below the cut-off is considered deprived in that indicator.

Step 2, the deprivation of each person is weighted by indicator's weight, if the sum of the weighted deprivations is *33* % or more of possible deprivations, the person is considered to be multi-dimensionally poor.

MPI mathematical structure

The index has ten indicators, two for education, two for health and six for living standards. The indicators of the MPI were selected after a thorough consultation process involving experts in all three dimensions. The poverty headcount (*H*) or percentage of people who are poor and the Average Intensity of deprivation (*A*), which reflects the proportion of dimensions in which households are deprived. The method has the mathematical structure of one member of a family of multidimensional poverty measures. This member of that family is called M_0. The three dimensions are equally weighted, so that each of them receives *1/3* weight (see Table 1 for details).

The MPI of *X* given deprivation cut-off vector *z*, poverty cut-off *k* and weight vector *w* is:

$$MPI(X) = \frac{1}{n}\sum_{i=1}^{n} ci(k) = \frac{q}{n} \times \frac{1}{q}\sum_{i=1}^{n} ci(k) = H \times A \quad (1)$$

Where: q is the number of poor, for those whose deprivation score is below the poverty cut-off, even if it is non-zero, this is replaced by *"0"*, what we call censoring in poverty measurement (see Table 2 for definitions of cut-off). The multidimensional headcount ratio (H), also frequently known as the poverty incidence, which is the fraction of the population identified as multi-dimensionally poor. It is simply given by:

$$H = \frac{\sum_{i=1}^{n} \rho k\,(xi;z)}{n} = \frac{q}{n} \quad (2)$$

The average deprivation shares across the poor, that is, the average fraction of dimensions in which the poor are deprived. This is also called the intensity (or breadth) of poverty (A). It is the average deprivation score of the multi-dimensionally poor people and can be expressed as:

$$A = \frac{\sum_{i=1}^{n} ci(k)}{qd} \quad (3)$$

Where: $c_i(k)$ is the censored deprivation scored of individual i and q is the number of people who are multi-dimensionally poor.

H and A can be easily combined into one single measure, called by the authors Mo, which is just the headcount ratio 'adjusted' (ie. multiplied) by breadth of poverty; $M_o = HA$, simply the MPI is a product of both:

$$MPI = H \times A \quad (4)$$

A person is identified as poor if he or she is deprived in at least one third of the weighted indicators. Noted that, all the M_o measures can be decomposed by population subgroups, one of our principal interests in this study is to understand sub-locality poverty. The MPI is helpful in this respect as it is subgroup decomposable. Let us denote the achievement matrix of subgroup ℓ by X^{ℓ} which has a population size of n^{ℓ} for all $\ell = 1, \ldots, m$. Then we can express the overall MPI as:

$$MPI(X) = \sum_{\ell=1}^{m} \frac{n\ell}{n} M(X^{\ell}) \quad (5)$$

The share of subgroup ℓ to the overall poverty is given by

$$(n^{\ell}/n) \times [MPI(X^{\ell})/MPI(X)] \quad (6)$$

For our consideration urban and rural populations for n_1 and n_2, the two subgroups are respectively presented by two matrices of achievements x_1 and x_2. Then we have:

$$MPI(x;z) = \frac{n1}{n} MPI(x_1;z) + \frac{n2}{n} MPI(x_2;z) \quad (7)$$

Components of the MPI

1) Schooling: the MPI has 2 indicators that balance each other in the schooling element, one focuses on finished years of schooling of family participants, the other at if children are going to school. Years of schooling acts as a proxy for the level of knowledge and understanding of the household members. The deprivation cut-offs for this dimension, the MPI, requires that one member at least in the household has finished 5 years of education and that all children of school-age are attending grades 1 to 6 of school.

   Some important things to mention with the practice of constructing this indicator, sometime occurred that someone living with a family and there one member at least found 5 years of education is stated non-deprived, even though he/she may not be educated. Likewise, someone living in a family and there is one child at least not attending school is stated deprived in this indicator, even though he/she might have finished schooling. Again, members are living in one house where no school-aged children are stated non-deprived in school attendance. Henceforth the rate of deficiency in this indicator will reveal the demographic structure of the family and nation, as well as the educational achievements.

2) Health: the MPI has two health indicators, food of family members and adults or children who are malnourished. A child is under-weight if he/she is two or more standard deviations below the median of the reference population. Noting that, the global MPI does not state adults or children that are overweight as poor in nutrition, unless he/she is malnourished. For purpose of the present research, food security defines as when there was not enough food or money for food in the past 7 days. The second indicator uses data on child death. Generally, child deaths are preventable, being caused by infectious disease or diarrhoea. Child malnutrition also contributes to child death. In the MPI each household member is considered to be deprived if there has been at least one observed child death (of any age) in the household. It is important to observe that this indicator differs from the standard mortality statistics.

3) Living Standard: this indicator provides some fundamental indication of the quality of housing for the household these are: access to better-quality drinking water, access to better hygiene and the use of clean cooking gas, access to electricity and flooring material. The indicator covers the ownership of some consumer goods, each of which has a literature describing them: receiver, TV, phone, bicycle, motorcycle or freezer or does not own a car or

tractor. The cut-offs for each one can be determined according to the nature of the country under study, the assets index of the MPI by default is the same for all countries, it is relative cut-off rather than an absolute cut-off for, and rarely used for comparable purposes across countries or across time. Also prices have been difficult to use to build the asset index as the surveys lack information on the price, quality or age of assets. Clearly, all the living standard indicators are means rather than ends, some of the common classification that has been identified as follows:

- Water: water for family needs do not include vendor-provided water, tankers trucks or unprotected wells and springs, if the water source is/or piped water, public tap, borehole or pump, protected well, protected spring or rainwater and it is within a distance of 30 minutes' walk (round-trip) a family is not poor in this term of drinking water. If it fails to satisfy these conditions, then the household is considered deprived of access to water.
- Hygiene: if the household has some type of flush toilet or latrine, or ventilated improved pit or composting toilet, a person is considered to have access to improved hygiene, provided that they are not shared, otherwise, it is considered deprived of hygiene.
- Electrical energy: if a person does not have access to electricity it is considered to be deprived here.
- Overcrowding: if there is at least 4 members per room.
- Cooking gas: a household is measured deprived of cooking gas if no gas is available, it cooks with dung, charcoal or wood.
- Employment: if a female head of household does not have monthly salary or does not own at least 2 acres to farm then each person in it is measured poorly.

Data

This study attempts to examine the female multidimensional poverty in Al-Hasaheisa Locality as a case study of the research and the source of data, the locality state in Gezira State. The analysis relies on primary data on education, health and standard of living, to test the various hypotheses relating to the objectives of the study and field work cover whole the locality including 6 administrative units.

The Gezira State has a total area of 27,549 km2 with population size about 4.2 million; 48% males and 52% females and 625,543 thousand households, with the average size of 6 persons according to [9]. Gezira State the second

most populous after Khartoum state, about 9.1% of total population of Sudan. Administratively, the state is organized into 8 localities namely, Al-Hasaheisa, Greater Wad Medani, AlManaqil, Janob AlJezira, Sharg AlJezira, AlKamlin, Um AlQoura and 24-AlQurashi. Each locality consists of a number of administrative units, which are similar in terms of demographic characteristics and economic activities.

The locality is organized into (7) administrative units namely, AlHasaheisa AlMadina, AbuQoota, AlMihaireeba, WadHaboba, AlMasallmiya, Tabaat and Alribia', distributed between urban and rural areas. The rationale behind selection of the Al-Hasaheisa Locality as a source of data are two folds first, geographically it located northern Gezira State and southern Khartoum the capital of Sudan. Second, it is a home of major governmental institutions and a huge industrial area, like Al-Bagier and Giad, where the majority of adult employees working there.

Sample size

Al-Hasaheisa Locality constituted the main sampling domain, in each of the administrative units, a two stage cluster sampling designed is employed to draw the sample for the purposes of the study. The clusters are distributed to urban and rural areas, proportional to the size of urban and rural populations in these administrative units. The villages in the case of rural areas and blocks across town in the case of urban areas constitute the primary sampling unit. The urban and rural clusters in each administrative unit are selected randomly with probability of selection proportional to size. The sample did not include nomadic population due to lack of proper sampling frame for them and problem of accessibility. Also, institutional households, camps etc. as well as homeless part of population were excluded from the sample. This represents the first sampling stage.

The second stage is conducted by listing all households headed by adult workers within the selected sample unit. In order to having a random and representative sample, in addition to provide good geographic coverage. The households' sample size is determined according to the equation Richard Geiger, given by:

$N=P(1-P)\ Z2/D2.$

Where:

N: the sample size;

P: the prevalence of the phenomena in the population under study;

(1-P): being the probability of failure;

Z: the critical standard value corresponding to the 95% confidence level and D: the degree of precision.

For the calculation of the sample size, at 95% confidence interval (D) is assumed to be 5% level of significance of the true value, as such (Z) is equal to 1.96. Based on a previous study, [9] about 46.5% of the Northern Sudan' population is found below the national poverty line, at that time the poverty line was 113.8 SDG per person per month. Therefore, the estimated population proportion (P) is set at 0.46, setting (D) = 0.05, using these values into the above equation, we obtain the sample size of 382 households.

In order to increase precision, which might be lost as a result of adopting a multi-stage random sampling method and allowing for some non-response in the survey, we multiply the sample size by the design effect factor, which is equal to 2, so that the final sample size drawn from the population under study approximately a total of 764 questionnaires were administered to households while a total of were administered to healthcare providers and teachers staff.

The total sample of households is selected on the basis of the cluster sampling methods and will be distributed between administrative units of the study area according to the probability proportionate to the population size in each unit. In cases where a selected village could not be reached because of unsafe or access difficulties, it was changed by a nearby village in the sampling framework. For purpose of the questionnaire shows that the urban population makes up about 15% of the study sample, it means approximately 15% = 115 of households were drawn from the blocks and 85% = 649 were randomly selected throughout the villages, all samples distributed equally between two groups. Furthermore, no differentiated has done between adult employees in governmental sector or private sector.

Questionnaire

Single survey was set to households, using structured questionnaire with head of households or other knowledgeable members on behave of she. The questionnaire administration was –sectional in nature. It delves on households' economic, social and demographic data. The study adopted the form modules designed by expert team of OPHI for computing the MPI for developing countries. The data collected were associated with CBS, Gezira State and were administrated to be in ~ 30 minutes per household.

Overall time management is left to the enumerator staff, as many factors determine how many villages and blocks can be surveyed per day depending on the distances between houses. All respondents are in good health and are in age between 25-60 years old; the working age according to Sudanese labor law.

The questionnaire is divided into two main sections. Section (1), at the top of the household questionnaire, for collecting basic demographic data about the survey respondent and the head of the household. These data are very useful in providing a quick overview of the characteristics of the respondents and households in the randomly sampled population, and allow to better understand the nature of data collected.

The questions in this section relate to variables such as head of the household's age and gender, respondent's age and gender and marital status of the head of the household. Section (2) is meant to collect data on household's income by source. Section (3) relates to information on household's expenditure by item, including expenditure on food, housing, source of fuel, clothing, education, and medical treatment. Section (4) is devoted for questions related to some poverty correlates. These include house characteristics such as tenure status, type of cooking fuel, type of lighting, source of drinking water. Section (5) includes questions related to ownership of valuable assets, which may provide information on variables other than income and expenditure that could influence households' standard of living.

Field work began on 20 March to 10 of April 2023, about 12 enumerators (divided into 4 groups) employed to collect data from the households identified for this study under the supervision of the director of CBS in Gezira State.

Data coding and processing

To ensure that the data are accurate and quality control, data were entered using Excel Sheet Files, 10% from each cluster is selected randomly to check that the data were entered correctly. The Data from the study were run through Statistical Package for Social Science (SPSS) and all data recorded into numerical codes, according to the poverty cut-off settled as shown in Table 3. All villages and blocks are organized under their administrative units. Likewise, each administrative unit is organized under its locality, and then urban/rural data were organized for the purposes of the study.

Table 1: MPI Dimensions, Indicators and Weights

Dimensions	Indicator	Poverty Cut-off	Related to…	Weight
Education (1/3)	Years of education (1/6)	No member of the household has done 6 years of education.	MDG2	16.67%
	Child staffing (1/6)	Any child school-age is out of school in years 1-86.		16.67%
Health (1/3)	Food (1/6)	Any child or adult for whom there is nutritional data is undernourished.	MDG4	16.67%
	Child mortality (1/6)	One child at least has died in the household in the last 5 years.	MDG1	16.67%
Standard of living (1/3)	Electrical energy (1/18)	The family has no electrical energy.	-	5.56%
	Better hygiene (1/18)	The family's hygiene ability is not better or it is public.	MDG2	5.56%
	Better-quality drinking water (1/18)	The family does not have access to better drinking water, waking up 30 minutes from home-based, roundtrip.	MDG7	5.56%
	Flooring (1/18)	The household's ground is dirty, sandy or dunging.	-	5.56%

	Cooking gas (1/18)	The family cooks with charcoal, wood or dung.	MDG7	5.56%
	Assets (1/18)	The family does not own one of: receiver, TV, phone, bicycle, motorcycle or freezer or does not own a car or tractor.	MDG7	5.56%

Table 2: Definitions of Cut-off points for each MPI Dimension Employed by the Empirical Model

No.	**Dimension**	**Cut-off Points**
1	School Enrolment	At least one child, age 6 and above, is not currently enrolled in school.
2	School Attendance	No household member has completed 6 years of schooling.
3	Child Mortality	Any child has died in the family in the last 5 years.
4	Food Security	There was not enough food or money for food in the past 7 days.
5	Overcrowding	Household lives with 4 members and above.
6	Electricity	Household not electrified.
7	Cooking Gas	The household cooks with dung, wood or charcoal.
8	Sanitation	If the household doesn't use a flush toilet, unimproved latrine, pit or shared.
9	Safe Drinking Water	If the water source piped outside the house.
10	Employment	The member 25+ is unemployed and looking for work.

Table 3: Binary Scoring Indicators/ Poverty Cut-off

Indicator	**Definition of Indicator**
School Enrolment	1 if at least one child, age 6 and above, is not currently enrolled in school; 0 otherwise.
School Attendance	1 if no household member age 6 and above has completed 6 years of schooling; 0 otherwise.
Food Security	1 if there was not enough food or money for food in the past 7 days; 0 otherwise.
Child Mortality	1 if at least one child has died within the household during last 5 years; 0 otherwise.
Overcrowding	1 if 4 members of household per room; 0 otherwise.
Electricity	1 if the house is not electrified; 0 otherwise.
Cooking Gas	1 if the household has no gas for cooking; 0 otherwise.
Sanitation	1 if the household doesn't use a flush toilet or shared; 0 otherwise.
Safe Drinking Water	1 if the water source piped outside the house; 0 otherwise.
Employment	1 if the member 25+ is unemployed and looking for work; 0 otherwise.

IV. Results and Discussions

The researcher could reach the following findings. A total (764) of households headed by adult workers was interviewed in Al-Hasaheisa Locality reside over 6 administrative units, the study estimated MPI using 10 indicators across 3 dimensions adopting, the result observed that, 43.62% of total adult workers under the study area are experience multidimensional of deprivation. The finding proved the validity of the first hypothesis, the structure of poverty among the poor female householders of Al-Hasaheisa Locality. The dimension of standard of living in general, the highest contributor to poverty about 50.33% deprived across the six indicators of dimensions, and the share of health and education of MPI are 34.81% and 14.86% respectively, with high figure assessed to child mortality contributed most to poverty about 22%, all workers interviewed regarding the objective of this study are earn monthly income.

The finding proved the validity of the second hypothesis, having a job is not enough to keep the adult workers and their families out of poverty, most of male and female workers and they are head of households interviewed for this study have monthly a minimum wage of 50 Sudanese pounds and not exceeding 130 Sudanese pounds and they spend their wage income are forms of economic investments such as education in order to secure better future live to their children. Table 4 shows the contribution of deprivation in each dimension to overall MPI.

The results show important differences in poverty among the two different groups. Households headed by female-workers represent high level of deprivation (52.37%) than other households headed by male-workers (46.49%). The finding proved the validity of the third hypothesis, female workers head-households are poorer than male workers head-households more details in Table 5.

As estate by [20] female have been shown to be vulnerable to extreme poverty because they face greater burdens of unpaid work, have fewer assets and productive resources than men, earn less than men, are more likely to work in sectors that have lower average incomes, and are also likely to be engaged in part-time work due to the burden of unpaid work, Table 5 and Figure 1 present the details.

Overall, 50.86% of employees in rural areas are multidimensionally poor, although, they are better of compare to 48.07% in urban ones. The finding proved the validity of the fourth hypothesis, population in rural areas are deprived more often than urban areas. Similar findings obtain by [21] on his study about female-workers, rural areas are significantly poorer than urban ones, this means that, the value of wage employment is important to women's economic empowerment and the female they have little access to services and few opportunities to become more productive and being employed have a positive and significant effect on multidimensional wellbeing of households.

Furthermore, the analysis across dimensions in comparing between urban and rural areas, reveals that a higher deprivation level is observed in rural areas in the case of standard of living contributes to 49.53% to overall MPI value with a highest value reported by overcrowded house indicator 11.32% of households with 4 members and above per room. This implies that, the majority of the household are deprived in necessities of life, they do not have enough money to meet basic needs. 9.83% of the houses are not electrified, approximately 10.13% do not have improved hygiene facilities and 6% of households use unimproved cooking fuel, cooks with dung, wood and charcoal. The share of health and education of MPI are 35.14% and 15.33% respectively.

Similar result for urban areas, the main contributor to MPI value is of standard of living, but likely, the rate close to the rate of health dimensions 41.83% and 39.84% respectively, the share of education dimension is 18.33%. It worth to noting that the status of educated adults in rural areas is better off than in urban areas and this is not surprising since the Gezira Scheme Board, the big agricultural project located in Gezira State expenses to schools as a duties of social responsibilities. Health dimension contributes positively to poverty, in terms of the number of death among child under five age, by contrast, low level education dimension contributes relatively little to poverty for two groups. However, expenditures on primary school and health significantly reduce the incidence of multidimensional poverty. These results assert that development in the State is unbalanced Table 6 and Figure 2 describes the status of deprivation of adult workers by regions urban/rural at Al-Hasaheisa Locality.

The findings of this study are consistent with the findings of the [9], where the standard of living across Sudan is found to be on average far lower than health and education achievements. Similar result reveals by [22] the money deficit arising from labor and labor deficiencies is the major factor causing female householders' poverty, due to the most Sudanese female householders are engaged in temporary employment and part-time work (62.5%) and about 40% of female householders have experienced unemployment over the past year, demonstrating typical characteristics of the working poor who are incompletely involved in the labor market.

V. Conclusion

The present study provides an analysis of poverty in Al-Hasaheisa Locality, as a topical issue to sustainable development, as well as targeting alleviation of poverty as a highly rated development objective and perhaps a critical one for our study area. Poverty remains the most pressing socio-economic issue in Sudan and is a multi–faceted phenomenon. The link between workers and poverty is a critical way. This paper is set to investigate the persistence of multidimensional poverty among adult workers in Al-Hasaheisa Locality, following the approach proposed by Alkire-Foster model made up of 10 components has been built and used as a means of analyzing the data, education dimension presented on two indicators, two indicators for the dimension of health, while the dimension of the standard of living expressed on six indicators. The research relies on primary data which cover a broad spectrum of socio-economic parameters based on 6 administrative units, aided by structured questionnaire compiled by Central Bureau of Statistics staff for year 2023, field work covering 6 administrative units. A total of 764 households headed by adult

workers was randomly selected and interviewed make up for the data source, analysis of poverty decomposed by male/female workers and by urban/rural regions. The value of the MPI that was calculated is significantly high, the results show the adult-workers' householders are experience a multidimensional poverty under the study area, with deprivation equal or less than a third of overall three dimensions. Moreover, the analysis expressions decompositions reveal considerable disparity in multidimensional poverty index, households headed by female-workers represent high level of deprivation than one headed by male-workers and the deprivation seem to be concentrated in all dimensions and the most intuitive factor underlying multidimensional poverty in all aspects is the dimension of standard of living. The finding proves that rural areas in Gezira State are lagging behind urban areas in terms of development, the current status in regard to most the indicators is far from being satisfactory. The study concludes having a job is not enough to keep the workers out of poverty since employed persons are just as vulnerable to poverty as everyone else. Therefore, the study recommends government policies aim to reduce poverty should be raising the level of wages and increasing employment opportunities by creating a new jobs and realization of equitable and balanced development as a top priority for eliminating poverty, with paying more attention to rural areas.

Table 4: MPI Indicators of Deprivation for Adults Workers of Al-Hasaheisa Locality

Domain	**Dimension**	**Adult Workers**
Education	Children age 6-14 not attending school	6.06
	Population not completed 5 years of schooling	8.8
Health	Population malnourished	14.83
	Families with at least one death under 5 years	19.98
Standard of Living	Households with overcrowded	15.91
	Households with no electricity	14.67
	Households cooking with wood or charcoal	6.48
	Households with no sanitation	9.93
	Households with no safe drinking water	1.56
	Member 25+ is unemployed and looking for work	1.78
Total MPI		**43.62**

Table 5: MPI Indicators of Deprivation for Adults Workers Male/Female of Al-Hasaheisa Locality

Domain	**Dimension**	**Adult Workers %**	
		Male	**Female**
Education	Children age 6-14 not attending school	6.11	9.11
	Population not completed 5 years of schooling	8.8	11.07
Health	Population malnourished	13.8	13.05
	Families with at least one death under 5 years	17.96	20.83
Standard of Living	Households with overcrowded	10.91	12.82
	Households with no electricity	9.67	5.64
	Households cooking with wood or charcoal	10.0	4.11
	Households with no sanitation	9.93	10.23
	Households with no safe drinking water	2.04	4.35
	Member 25+ is unemployed and looking for work	10.78	8.79
Total MPI		**46.49**	**52.37**

Table 6: MPI Indicators of Deprivation for Adults Workers Urban/Rural Regions of Al-Hasaheisa Locality

Dimension	**Urban Region**	**Rural Region**
Children age 6-14 not attending school	10.11	8.33
Population not completed 5 years of schooling	8.22	7
Population malnourished	22.41	20.53
Families with at least one death under 5 years	17.43	14.61
Households with overcrowded	9.55	11.32
Households with no electricity	7.76	9.83
Households cooking with wood or charcoal	5.43	6.01
Households with no sanitation	6.44	10.13
Households with no safe drinking water	4.65	3.24

Member 25+ is unemployed and looking for work	8	9
MPI	**48.07**	**50.86**

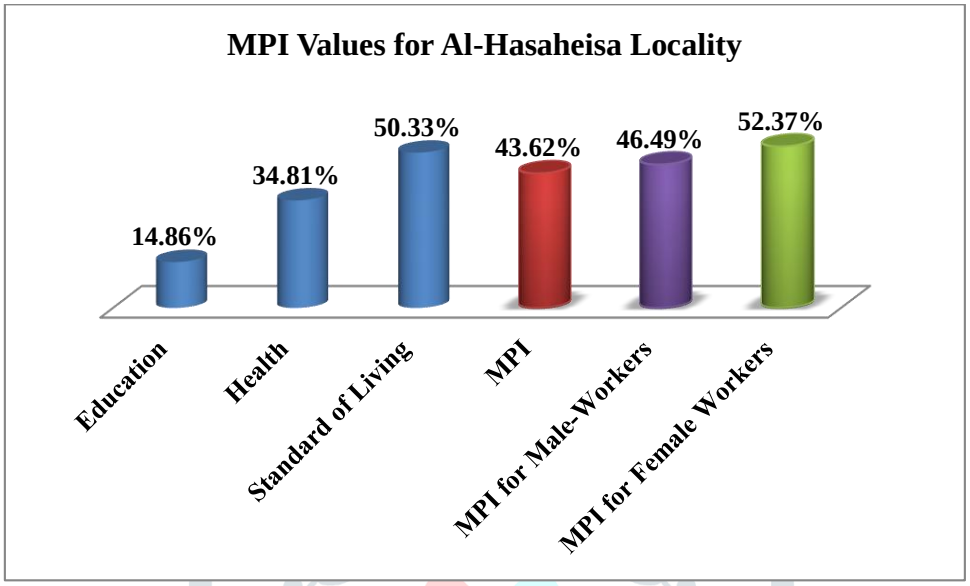

Figure 1: The Contribution of Deprivation in each Dimension to Overall MPI

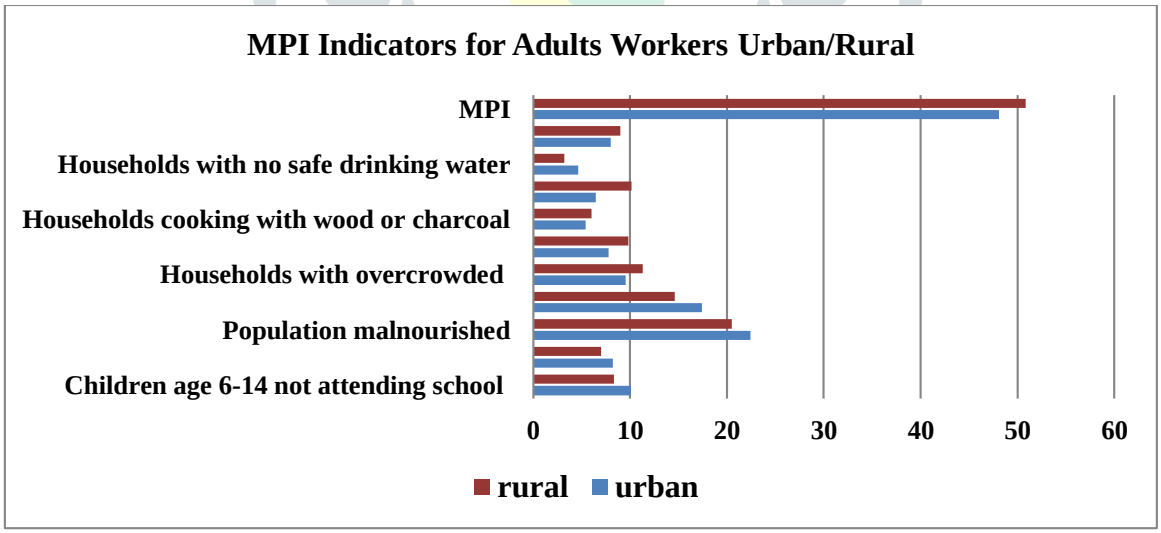

Figure 2: MPI Indicators for Adults Urban/Rural Areas at Al-Hasaheisa Locality

Declarations

Availability of data and material

All data of empirical results of this paper are available upon request.

Competing interests

The author declares that they have no competing interests.

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Author contribution

The conceptualization, methodology, data curation and analysis, findings, interpretations and conclusions expressed in this original draft paper are those of the author.

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