

Prevalence and Determinants of Disability among Elderly: A Case Study of Gezira State, Sudan 2021

Aamir Abdoalwhab Ahmed Osman ¹

Ahmed Mohammed Hamad Alnory ²

Abstract

The prolongation of the life span has led to an increase in the number of older people and an increase in the prevalence of disability in people over 60 years of age. The aim of this study was to estimate the prevalence of ADL disability and analyze its determinants among people aged 60 and older living in Gezira state, Sudan, in 2021. Cross-sectional design was used to conduct the study among the elderly of Gezira State. The study involved 1200 older people aged 60 years and over. The Katz Index of Independence in Basic Activities of Daily Living was used to assess disability. Logistic regression model was used to identify the factors related to ADL disability. According to the findings, 24% of respondents reported at least one difficulty with ADLs, and the prevalence of disability among women was significantly higher than that of men. Furthermore, the most frequent problems in ADL were found in toileting (17.2 %) and transferring (13.9 %). The results of logistic regression obtained that after age, the factors with the highest impact on ADL disability were poor SRH, have arthritis and depressive symptoms and lack of social participation. The study recommended that the Sudanese government should formulated national policy for the elderly. In addition, in order to improve the elders' potential to contribute to national development, national strategies for older people should be established, including disability prevention programs that include improving education, early diagnosis and treatment of non – communicable disease and depression, and extending the participation of the elderly in community.

¹ Lecturer – Applied Statistic and Demography – Faculty of Economic and Rural Development - University of Gezira

² Professor- Applied Statistic and Demography – Faculty of Economic and Rural Development - University of Gezira

1. Introduction:

The concept of ageing is an associated word that refers to the process by which persons or adults are attending chronological ages that are classified as old ages. Ageing also refers to a process by which the elderly or older persons constitute higher proportion of the total national population than at an initial period (Weeks 2012). The population structures of countries around the world are changing. The proportion of the older aged population is increasing while that of the younger aged population is decreasing. This phenomenon, called “population aging”, resulted from the demographic transition from high to low levels of both fertility and mortality. According to the estimation of the United Nations (2017), the global population aged 60 years and over numbered 962 million in 2017, more than twice as large as in 1980 when there were 382 million older persons world wide. In 2019, the number of people aged 60 years and older was 1 billion. This number will increase to 1.4 billion by 2030 and is expected to be 21 per cent (2 billion) by 2050, and over half of these older people will be living in developing countries (United Nations 2019). The pace of population aging of each country varies, owing to the difference in its stage of demographic transition, which is related to economic and social development. According to population censuses, the percentage of people aged 60 and over in Sudan had increased from 2.5% to 5% in less than 30 years, with a temporary prediction of 7.5% in 2021. (CBS, 1983, 2008,2021). The growing aging population is an outcome of the demographic transition that has occurred over the last thirty years. Sudan is currently transitioning into stage three of the demographic transition. The TFR in Sudan declined from 5 in 2008 (CBS, 2008) to 4.3 in 2020 (World Bank, 2020), and life expectancy at birth increased from 60 years in 2008 to 66 years in 2020 (World Bank, 2020), leading to an increase in the number and proportion of older population. The prolongation of the life span has led to an increase in the number of older people and an increase in the prevalence of disability in people over 60 years of age. over 1 billion (15%) individuals worldwide have experienced one or more disability conditions. The global trends among the ageing population and the risk of disability lead to a higher disabled population (DESA, 2016). Over 45% of older adults aged 60 and over have difficulty performing everyday activities, and over 250 million people experience disabilities to a moderate or significant degree (UN, 2015). Disability is commonly defined as a difficulty in performing activities necessary for independent living, such as basic activities of daily living (ADLs). Disability among older people is the result of not only health problems but also the interactions

between health condition, activity and participation, personal factors and environmental factors (Connolly D, et al , 2017). Sudan started gathering data on disability in the fourth population census 1993 followed by 2008 population census which contributing in the updating of the database. The results of the census provide baseline data that may be useful for estimating prevalence of disability and the prevalence of different types of disability. According to the population census, the overall rate of disability in Sudan risen from 1.6% in 1993 to 4.8% in 2008. Disability prevalence among the elderly was projected to be 26% in 2008, which was higher than the range of prevalence found in developing countries (ranging from 6.5% to 24.7%). Although the census provides substantial information on disability, the types of questions included in the 2008 population census cannot provide a precise assessment of disability or the causes of disability. Therefore, this study attempts to estimate the prevalence of disability among elderly in Gezira State.

2. Objectives of the Study:

- To estimate the prevalence of disability in term of Activities of Daily Living (ADL) among older people in Gezira state, Sudan 2021
- To recognize which tasks of daily living limit the ability of the elderly to function.
- To determine factors associated with ADL disability among elderly in Gezira state

3. Methodology:

3.1 Sample Size:

The sample size was calculated by using Cochran 1963 formula as following:

$$n = \frac{z^2 * p * (1 - p)}{d^2}$$

where:

n*: the initial sample size

z: the standard variable of the normal distribution corresponding to 95% confidence level

p: the anticipated population proportion of disable elderly

d: the absolute statistical precision on either side of anticipated population proportion of disable elderly.

by taking P = 0.50 (assumed the prevalence of disability is 50%) % and d = 0.04 then, the initial sample size will be:

$$n = \frac{1.96^2 * 0.5 * (1 - 0.5)}{0.04^2} = 600$$

The total number of population age 60 and over in Gezira state (N) is 1,974,511 (CBS, 2008), so n^* will represents the final sample size as N is greater than 10000 (Cochran, W. G., 1963).

However, in the actual field survey, simple random sampling is not the method of data collection because of non-homogeneity of the population under the study (i.e., localities of Gezira State), therefore, the design of the sample for this study will be change to multi stage cluster stratified, this require multiplying the sample size by the design effect which taken to be (2), hence, the actual sample size will be 1200

3.2 Data collection:

A questionnaire was used to collect demographic data and environmental factors. Data were also collected on subjects' chronic illnesses, depressive symptoms, exercise, obesity, alcohol consumption, smoking status and sleep. Furthermore, the questionnaire contained questions about social participation and relatives and friends contact. The Katz ADL Scale was used to assess the activities of daily living (Katz, et al,1970). For ADL, respondents were asked whether they had difficulty dressing, bathing, feeding, moving, and toileting.

3.3 Analytic Methods:

For the analysis, the participants were divided into persons without any difficulties and persons reporting at least one ADL limitation. Dichotomous variables were created, with a value of 1 if the participant showed a limitation in one of ADLs and a value of 0 if the participant did not show any limitations. The chi-squared test was used for preliminary analysis of association between independents variables and ADL disability. logistic regression was obtained to identify factors related to ADL disability.

4. Results:

4.1 Demographic Characteristics:

Table (1) Demographic characteristic of elderly

Variable	Frequencies	Percent
Age		
60 -64	295	27.6%
65 – 69	306	28.7%
70 – 74	192	18%
75 – 79	120	11.2%
80 – 84	65	6%
85+	90	8.50
<i>Total</i>	1068	100%
Gender		
Men	59%	632
women	41%	436
<i>Total</i>	100	1068
Residence		
Urban	380	35.6%
Rural	688	64.4%
<i>Total</i>	1068	100
Type of Family		
Nuclear	777	73%
Extended	291	27%
<i>Total</i>	1068	100
Marital Status		
Single	47	4.4%
Married	765	71.6%
Divorce	40	3.7%
Widowed	216	20.3%
<i>Total</i>	1068	100
Educational Level		
Illiterate	395	37%
Primary	340	32%
Secondary	196	18.1%
University	100	9.4%
Above University	37	3.5%
<i>Total</i>	1068	100%

Source: Own calculation from survey data, Gezira State (2021)

Table (1) show the distribution of demographic variables. More than half of the respondents are located in age groups ranging between (60-64) and (65-69) representing 27.6 % and 28.7% respectively, and above third 35.2% of the elderly have ages ranging between 70 and 84 years. Also, the results illustrate that approximately 10% of respondents had reached the oldest age. close to 60% of the elderly were men and 41% of them were women. The sex ratio of elderly was calculated at 1.44 which means that there are 144 elderly men for every 100 elderly women. Almost 64% of old people reside in rural areas, compared to 35% residing in urban areas. three quarters of elderly live within an extended family and 27% of the respondents reported that they stay with their nuclear family.

Moreover table (1) illustrate that approximately three - quarters of the elderly were married, a 20.3% had experienced divorce and a little few proportion of the respondents lost their partner or never get married. Regarding the distribution of participants according to educational level it is clearly observed that more than half of the respondents are illiterate and primary school representing 37% and 22% respectively. The rest have educational level including intermediate, secondary, university, and postgraduate, representing 10% ,18.1%,9.4%, and 3.5% respectively. These findings, indicates that the elderly in Gezira state is poor in terms of education.

4.2 Physical Environmental:

Table (2) Physical Environmental Factors

Variable	Frequencies	Percent
Home ownership		
Owned	952	89%
Rented and public	116	11%
Total	1068	100
Home Kind		
cement	207	19.4%
Bricks	772	72.10%
mud and other	89	8.5%
Total	1068	100
Number of Rooms		
One room	113	10.6%
Two rooms	425	40%
Three rooms	405	38%
Four rooms	125	11.4%
Total	1068	100
Kind of floor		
Of earth	524	49%
Of Bricks	266	25%
Of ceramics	278	26%
Total	1068	100
Source of Drinking Water		
Safe drinking water (tap water)	492	47%
Un safe drinking water (Canal and tanker...etc)	540	53%
Total	1068	100
Type of sanitation		
Siphon	308	29%
Pit latrine and well	760	71%
Total	1068	100
Ownership of durable goods		
Yes	730	68%
No	338	32%
Total	1068	100

Source: Own calculation from survey data, Gezira State (2021)

Table (2) shows the answers given by the respondents about their home environment. The vast majority of the respondents stated that they did own their house, and a few of the elderly reported that they didn't own their home. Around half of the respondents have

more than two rooms in their home while 40% have two rooms, and a little proportion of the respondents reported that they have only one room. Approximately three quarters of the respondents stated that their homes were made of bricks and 19.4% were made of cement. Only 8.5% of the respondents built their house from mud and other components such as straw or Zink. Close to fifty percent of the elderly reported that they have tap water (pipe inside the house) as a source of drinking water and up to fifty 53% of the respondents are taking water from the canal. Most of the respondents haven't an improved sanitation in their house and close to fifty percent of the respondents had a floor made of earth while a quarter of them reported that their floor was made of bricks while 26% of the respondents stated that their houses' floor was made of ceramic.

Regarding a question in the survey labeled durable goods, the elders who own more than two of the essential goods, namely, car, TV, refrigerator, radio and mobile were labeled "Yes". Those who do not are labeled "No" and the total number of responses that subscribe to yes category was 730 representing two thirds (68%) of the overall elders while those in the No category representing one third (32%).

These findings revealed that, the majority of elderly in Gezira state lives in crowded houses (one or two rooms, traditional building, flooring made of earth or bricks, poor sanitation, and un safe drinking water) which are signs of poverty. The daily activities of the elderly are predominantly conducted at home, and people may have a strong emotional attachment to the house in which they have lived for many years. Housing also serves as a platform for achieving a favorable living environment and service outcomes, and it thus can improve the independence of the elderly. Inappropriate environmental designs and facility supports may significantly decrease the ability of the elderly to live independently when taking into consideration their ADLs.

4.3 Social contact and social participation:

Table (3) Social Contact and Social Participation

Variable	Frequencies	Percent
Relatives Contact		
Never	148	14%
once a year	52	5%
monthly	333	31%
once a week	292	27%
Daily	243	23%
Total	1068	100%
Friends Contact		
Never	181	17%
once a year	54	5%
monthly	210	19.7%
once a week	453	42.3%
Daily	170	16%
Total	1068	100%
Social participation		
Yes	425	40%
No	643	60%
Total	1068	100%

Source: Own calculation from survey data, Gezira State (2021)

Table (3) contains information provided by the elderly regarding their social contact with their friends and relatives as well as their participations in the community. 23% and 27% of respondents, respectively visited their relatives daily and once a week. A third of them claimed they contacted with their relatives each month. A little proportion of elderly spoke to their relatives once a year, and 14% stated that they never go to visit them. Additionally, the results in table (4.9) show that 42.3% of the elderly maintain weekly social contact with their friends .16% of the respondents stated that they visited their friends every day. Close to 20% reported that they contacted with their friends once a month and 5% claimed that they visited their friends once a year. Only 17% of the elderly reported that they had never gone out with friends. These results showed that approximately 50% of elderly people have little social interaction with their relatives or friends. As can be seen from table (3), 40% of the elderly reported participating in at least one type of community activity, while 60% of the elderly claimed that they had never participated. According to these finding, around two thirds of the elderly reported that they had never engaged in at

least one form of community activity, indicating that they would rather stay at home than make contribution in their community.

4.4 Previous Lifestyle and Behavior Factors:

Table (4) Previous Lifestyle and Behavior Factors

Variable	Frequencies	Percent
Smoking Status	112	10.5%
Obesity	86	8%
Alcohol consumption	22	2%
Regular Exercise	527	49.3%
Number of hour sleep per night		
8	367	34.4%
more or less than 8	701	66.6%

Source: Own calculation from survey data, Gezira State (2021)

Table (4) lists five different lifestyles including smoking, alcohol consumption, obesity, regular exercise, and sleeping. 10.5%, 8%, and 2% of older people were smokers, at risk for obesity, and alcohol addicts, respectively. Nearly two-thirds of the elderly stated that they slept less than or more than eight hours a day. Regularly sleep affects an aged person's ability to perform daily activities as they get older. Elderly who slept more or less than 8 hour a day are more susceptible to disability. Additionally, more than 50% of the respondents reported that they irregularly exercise. Long-term inactivity without regular exercise predisposes an elder person to disability

4.5 Health Characteristics:

Table (5) Epidemiological Profile of Communicable and non – communicable Diseases

	Frequencies	Proportion
Malaria	817	76.5%
Typhoid	358	33.5%
Dysentery	66	6%
Diarrhea	228	21%
Hypertension	277	26%
heart diseases	53	5%
Diabetic	306	29%
Arthritis	198	18.5%
Prostate	100	9.4%
Total	1068	100%

Source: Own calculation from survey data, Gezira State (2021)

Table (5) shows the distribution of selected communicable and non - communicable diseases reported by the elderly, including malaria, typhoid, diarrhea, dysentery, diabetes, heart diseases, hypertension, prostate and arthritis. The most infectious communicable diseases among elderly are malaria which account 76.5% followed by typhoid 33.5%, diarrhea 21% and dysentery 6%. On the other hand, diabetes and hypertension were

considered as the most prevalent non-communicable diseases among elderly, representing 29% and 26% respectively.

Table (6) Descriptive Statistics of non - communicable Diseases

Number of non - communicable diseases	Frequency	Percent	
None	360	33.7%	
1	390	36.5%	
2	214	20%	
3	67	6.3%	
4	29	2.8%	
5	8	0.7%	
Total	1068	100%	
N	1068	Skewness	1.01
Mean	1.10 (1.036-1.164)	Kurtosis	0.91
Std. Error of Mean	0.033	Minimum	0
Median	1	Maximum	5

Source: Own calculation from survey data, *Gezira State (2021)*

From table (6) we clearly observe that approximately two – thirds of the elderly have at least one of the non - communicable diseases and furthermore the distribution of the variable number of non - communicable diseases is seem to be normal around 1 . This indicates that the epidemiological profile of diseases among older adults is shifted towards non-communicable diseases.

4.6 Activity of Daily Living (ADL) Disabilities:

4.6.1 Distributions of ADL disabilities:

Table (7) Distributions of ADL disabilities in the elderly according to sex

	Total		Men		Women	
	N	%	N	%	N	%
With ADL disability	249	23.3	118	18.7	131	30
Without ADL disability	819	76.7	514	81.3	305	70
Total	1068	100	632	100	436	100

Source: Own calculation from survey data, *Gezira State (2021)*

Table (7) review the distribution of ADL disability among elderly. Of the 1068 sampled respondents we have, 249 reported at least one problem with ADLs disability giving a proportion of 23.3% in the sample. However, this proportion has to be adjusted by:

- The total population of the population 60 and over in Gezira state projected from 2008 for the proportion to be a prevalence rate using the following Population correction factor rearranged:

$$\text{Prevalence rate} = \frac{P}{1 - \frac{k}{N}} * \sqrt{(N - n) / (N - 1)}$$

- The proportion reflected in the sample is based on a cross section which holds for approximately one month, thus it should be extrapolated seasonally to hold for one year to become a prevalence rate. The extrapolation was based on data from the 2008 census basic findings giving weights calculated from infection the age distribution.

Where:

P = the proportion with disability in the sample.

N= Total population in Gezira state

K = Elderly population age 60 and over

n = Sample Size

By subsequent N =3549026, n = 1068, k = 228480 and p = 0.233 then the prevalence rate will be:

$$P = \frac{0.233}{1 - \frac{228480}{3549026}} * \sqrt{\frac{3549026 - 228480}{3549026 - 1}} = 0.24$$

Table (8) Prevalence of ADL Disabilities in the Elderly, by Age and Gender

Age group	Total		Men		Women	
	Proportio	Prevalenc	Proportio	Prevalenc	Proportion	Prevalence
60 -64	0.113	0.165	0.108	0.130	0.12	0.179
65 – 69	0.157	0.195	0.110	0.137	0.224	0.276
70 – 74	0.218	0.277	0.132	0.168	0.355	0.454
75 – 79	0.325	0.365	0.303	0.340	0.364	0.465
80 – 84	0.477	0.524	0.420	0.461	0.53	0.584
85+	0.577	0.623	0.500	0.539	0.68	0.730

Source: Own calculation from survey data, *Gezira State (2021)*

As shown in table (8) and figure 1, elderly women had higher proportion rates of ADL disabilities in all age groups compared to elderly men. ADL disability prevalence also increased with age in both sexes.

4.6.2 Type of ADL disabilities:

Table (9) Distributions of ADL disabilities in the elderly, by type and sex

ADL	Total	Men	Women
Eating	4.3	4	4.80
Bathing	9.3	8	11.20
Dressing	11.8	10.3	14
Transferring	13.9	10.6	18.8
Toileting	17.2	12.8	23.7

Source: Own calculation from survey data, *Gezira State (2021)*

Regarding the type of ADL disabilities in table (9) and figure (2), the proportion of ADL restrictions was highest in toileting (17.2 per cent), followed by transferring (13.9 per cent), dressing (11.8 per cent) bathing (9.3per cent) and eating (4.30 per cent).

4.7 Bivariate Results:

Table (10) Association between Demographic Variables and ADLs Disability

Demographic Variables	ADL disability			Chi-square	df	P.value
	Without disability	With disability	Total			
Residence						
Urban	302(79.5%)	78(20.5%)	380(100%)	2.56	1	0.109
Rural	517(75%)	171(25%)	688(100%)			
Educational Level						
illiterate	266(67%)	129(33%)	395(100%)	37.16	5	0.000**
Primary	268(79%)	72(21%)	340(100%)			
Secondary	163(83%)	33(17%)	196(100%)			
University and above	122(89%)	15(11%)	137(100%)			
Family Type						
Nuclear	232(80%)	59(20%)	291(100%)	2.067	1	0.151
Extended	587(75.5%)	190(24.5%)	777(100%)			
Marital Status						
Single	38(81%)	9(19%)	47(100%)	36.96	1	0.000**
Married	618(81%)	147(19%)	765(100%)			
Divorce	31(77.5%)	9(22.5%)	40(100%)			
Widowed	132(61%)	84(39%)	216(100%)			

Source: Own calculation from survey data, Gezira State (2021)

Table (10) showed the association between ADLs disabilities and major demographic characteristics. The frequency distribution of educational level and marital status according to ADL disability revealed significant association, where about one third of elderly who had never attended school having at least one problem with ADLs. Furthermore, widowed and divorce older showed higher ADL disability than single and married seniors.

Table (11) Distribution of ADL Disability According to Sanitation and Sources of Drinking Water

Variables	ADL disability			Chi-square	df	P.value
	Without disability	With disability	Total			
Sanitation						
Improved sanitation	250(81%)	58(19%)	308(100%)	4.86	1	0.027*
Poor	569(75%)	191(25%)	760(100%)			
Drinking Water Sources						
safe	432(76%)	134(24%)	566(100%)	0.087	1	0.767
unsafe	387(77%)	115(23%)	502(100%)			

Source: Own calculation from survey data, Gezira State (2021)

Table (11) shows that ADL disability had a significant association with sanitation at significant level 5%. The proportion of ADL disabilities among elderly who had a poor sanitation was higher than those who had improved sanitation

Table (12) Association between ADL Disability and Lifestyle Behavior

Lifestyle	ADL disability			Chi-square	df	P.value
	Without	With	Total			
Smoking Status						
No	733(77%)	223(23%)	956(100%)	0.001	1	0.979
Yes	86(77%)	26(23%)	112(100%)			
Alcohol consumption						
No	802(76.7%)	244(23.35)	1046(100%)	0.004	1	0.948
Yes	17(77%)	5(23%)	22(100%)			
Obesity						
No	762(77.6%)	220(22.4%)	982(100%)	5.66	1	0.017*
Yes	57(66%)	29(34%)	86(100%)			
Regular Exercise						
No	391(72%)	150(28%)	541(100%)	11.93	1	0.011*
Yes	428(81%)	99(19%)	527(100%)			
hour sleep per night						
8 hours	295(80%)	72(20%)	367(100%)	4.27	1	0.039*
< 8	524(75%)	177(25%)	701(100%)			

Source: Own calculation from survey data, Gezira State (2021)

Results in table (12) showed the association between five kind of lifestyle behavior and ADL disability. The results revealed that regular exercise, obesity, and sleeping were significantly associated with ADL disability at significant level 5%. Those who never did regular exercise, at risk of obesity and daily sleeping less or more than 8 hours were more likely to have ADL disability.

Table (13) Association between ADL Disability and Diseases

chronic disease	ADL disability			Chi-square	df	P.value
	Without	With	Total			
Malaria						
No	212(84.5%)	39(15.5%)	251(100%)	11.09	1	0.001**
Yes	607(74%)	210(26%)	817(100%)			
Diabetic						
No	612(80%)	150(20%)	762(100%)	19.59	1	0.000**
Yes	207(67.6%)	99(32.4%)	306(100%)			
Cardiovascular diseases						
No	611(80%)	154(20%)	765(100%)	15.28	1	0.000**
Yes	208(68.6%)	95(31.4%)	303(100%)			
Arthritis						
No	695(80%)	175(20%)	870(100%)	26.87	1	0.000**
Yes	124(62.6%)	74(37.4%)	198(100%)			

Source: Own calculation from survey data, Gezira State (2021)

Table (13) illustrated that malaria, diabetes mellitus, cardiovascular diseases and arthritis had highly significantly related with ADL disability. Around 30% of elderly who infected with malaria at the last twelve months preceding the survey had ADL disability. The same results were observed for diabetes mellitus, cardiovascular diseases and arthritis, where the percentages of ADL disability were higher for those who have diabetes mellitus (32.4%), cardiovascular diseases (31.4%) and arthritis (37.4%).

Table (14) Association between ADL Disability and Social Participation

Social Participation	ADL disability			Chi-square	df	P.value
	Without disability	With disability	Total			
No	448(70%)	195(30%)	425(100%)	44.43	1	0.000**
Yes	371(87%)	54(13%)	643(100%)			

Source: Own calculation from survey data, Gezira State (2021)

With regarding to social participation during the six months before the interview date, the prevalence of ADL disabilities in the elderly who did not participate in any activities in their community were significantly higher than those who complete.

Table (15) Distribution of ADL Disability According to Self-Rated Health and Depressive Symptom

chronic disease	ADL disability			Chi-square	df	P.value
	Without	With	Total			
SRH						
Good	599(85%)	106(15%)	705(100%)	79.52	1	0.000**
Poor	220(61%)	143(39%)	363(100%)			
Depressive symptom						
No	520(86.5%)	81(13.5%)	601(100%)	74.33	1	0.000**
Yes	299(64%)	168(36%)	467(100%)			

Source: Own calculation from survey data, Gezira State (2021)

Table (15) demonstrates that ADL disability had a highly significant relationship with SRH and depressive symptom. Around 40% of the elderly who had depressive symptom were classified as having ADL disability. The same conclusion applied for those with poor self-rated health (SRH).

4.8 Multivariate Results:

Table (16) Variables in the Equation

Explanatory Variables	β	S. E	Wald	df	sig	Exp(β)
Age (reference 60 - 79)	1.384	0.198	40.05	1	0.000	3.98
SRH (reference good)	0.880	0.171	26.393	1	0.000	2.412
Arthritis (reference No)	0.784	0.198	15.603	1	0.000	2.190
Depressive symptom (reference No)	0.765	0.151	25.561	1	0.000	2.148
Social participation (reference yes)	0.638	0.192	11.108	1	0.001	1.893
Obesity (reference No)	0.610	0.283	4.640	1	0.031	1.840
Diabetes mellitus (reference No)	0.543	0.180	9.085	1	0.003	1.721
relatives contact (reference yes)	0.520	0.225	5.339	1	0.021	1.70
Sleep (8 hours)	0.340	0.180	3.561	1	0.059	1.404
Residence (reference urban)	0.305	0.198	2.362	1	0.124	1.356
Malaria (reference No)	0.254	0.217	1.368	1	0.242	1.289
Cardiovascular (reference No)	0.184	0.184	0.998	1	0.318	1.202
safe water (reference yes)	0.076	0.175	0.189	1	0.664	1.079
Education (reference educated)	0.074	0.187	.159	1	0.690	1.077
Improved sanitation (reference yes)	0.006	0.212	0.001	1	0.978	1.006
Constant	-4.684-	.402	135.62	1	.000	.009

Source: Own calculation from survey data, Gezira State (2021)

The results in table (16) showed that, independents variables such as age, arthritis, diabetes mellitus, SHR, depressive symptom, social participation, relatives contact, and obese made a significant impact on ADL disability. For age, elderly who reached advance age (≥ 80 years) have approximately four times more likely to face difficulties in performing the ADL activities compared with the youngest group. Furthermore, the results of logistic regression showed that respondents who had diagnosed with diabetes, arthritis and depressive symptom were more likely to have ADL disability with an odds ratio of 1.72, 2.19 and 2.148 respectively. In addition, the results explore that elderly who perceived themselves to have poor SRH were 2.441 times more likely to have ADL disability than those who perceived themselves to have good SRH. Regarding the lifestyle behavior of the respondents, the odds ratio indicate that obese elderly were 1.84 times more likely to have ADL disability. For social factors, elderly who did not have good relation with their relatives were 1.70 likely to have at least one ADL limitation than those who did. The same can be concluded for social participation, as respondents who did not participate in any community activities in the six months preceding the survey were nearly twice (1.89) as likely to have ADL disability as those who did.

5. Discussion:

This study was aimed to estimate the prevalence of ADL disability as well as to investigate the determinants of having one or more difficulties in ADL. The findings of this study show a higher prevalence of ADL disability among elderly in Sudan especially in Gezira state when compared to other large ageing studies. The proportion of the population in this study that reported having an ADL disability (24%) is more than study conducted in Nigeria by Abdulraheem et al., 2011 which showed that the prevalence of functional limitation was 15.7% and in US Health and Retirement Study (HRS) it was (18%). In term of ADLs types, the study revealed that the proportion of ADL restrictions was highest in toileting and transferring. These results are compatible with the study among Japanese elderly (Ichiro, et al., 1995) and study among THIA elderly population (Rakchanyaban, 2004). The presented study examined the relationship between ADL limitations and number of factors. The factors associated with ADL limitations were the following factors: advanced age, poor SRH, depressive symptom, have arthritis and diabetes, bad lifestyle behaviors like obesity, lack of relations with relatives and lack of participate in the communities' activities. Age is an important factor in elderly dependence (Burman et al., 2019). The current study results support the evidence that people are more likely to have ADL limitations as their age increases. Problems with ADLs significantly rise with age. Similar results were found by Arokiasamy, et al during the SAGE (2007 – 2010) study carried out in six countries: China, Ghana, India, Mexico, the Russian Federation, and South Africa. It showed the occurrence of at least one problem in ADL was 27.7% of people aged 60–69 and up to 44.0% of those aged 70 and more. The study also found ADL disability disparate significantly by gender, and the prevalence in women was significantly higher than that in men. This finding is in agreement with the results of previous studies obtained by Pian-Pian Zheng et al 2021 and Chalise, et al 2008 who showed that women are more likely to experience disabilities. In the current study it was found that elderly stated as having poor self-rated health had a significant increased risk of having ADL disability. This is in line with previous studies reported that elderly who perceived themselves in poor SRH were more likely to have at least one ADL limitation (Ng et al., 2006; Caskie et al., 2010; Bintiismail, 2016). In this study, suffering from depression had a significant impact on having at least one limitation of ADL. Previous studies found that elderly with depressive symptoms had a higher risk of having a disability (Guccione et al., 1994; Abdulraheem et al., 2006; Caskie et al., 2010; Bintiismail, 2016). The present study

found elderly having chronic diseases such as diabetes and arthritis had higher chance to face difficulties in performing ADLs activities. Previous studies had demonstrated established association between chronic diseases such as diabetes with higher risk of having functional limitation and physical disability (Gregg et al., 2000; Gregg et al., 2002; Figaro et al., 2006; Hairi et al., 2010; Bintiismail,2016). Moreover, in our study, elderly who did not have good relations with their relatives were 1.70 times more likely to have ADL disability. Agnieszka et al 2019 were found that maintaining good relations with relatives play an important factor influencing ADL disability. Social participation is another important factor. The social participation of older people is important for their independence. Social participation has a positive impact on the physical and mental health of older people, sustaining their performance of ADLs (Kanamori, et al ,2014; Agnieszka et al 2019). In this study, elderly who maintain low social participation in their community were almost twice as likely to have at least one ADL limitation. In support of previous studies investigating functional disability, this study also identified that high body mass index (obesity) was significantly correlated with disability in ADL. Obese elderly had 1.84 risk of having ADL disability. The results of this study also align with previous studies that reflected that people with obesity were at higher risk of disability (Wearing et al., 2006; Jensen et al., 2010; Bintiismail,2016).

6. Conclusion:

The present study aimed to identify factors associated with ADL disability among older people residing in Gezira state. In conclusion, the study found a high prevalence of ADL disability. Advanced age, poor SRH, depressive symptom, have arthritis and diabetes, obese, lack of relationships with relatives and lack of participate in the communities' activities had a significant impact on the prevalence of ADL disability in the elderly. The study recommended that the Sudanese government should formulated national policy for the elderly.

References

1. Abdulraheem, I.S., Oladipo, A.R., & Amodu, M.O. (2011). Prevalence and Correlates of Physical Disability and Functional Limitation among Elderly Rural Population in Nigeria. *Journal of Ageing Research*, 1-13.
2. Agnieszka et al, 2019. Determinants of ADL and IADL disability in older adults in southeastern Poland. *BMC geriatric* 10, 13
3. Arokiasamy P, Uttamacharya U, Jain K, Biritwum RB, Yawson AE, Wu F, et al. The impact of multimorbidity on adult physical and mental health in low and middle-income countries, *BMC Med*. 2015;13:178.
4. Bintiismail, 2016. Pattern and risk factors of functional limitation and physical disability among community – dwelling elderly in Kuala Pilah, Malaysia : A 12 – month follow – up study
5. Burman, J., Sembiah, S., Dasgupta, A., Paul, B., Pawar, N., & Ray, A. (2019). Assessment poor functional status and its predictor among the elderly in a rural area of West Bengal. *Journal of Mid – Life Health*, 10, 185 – 190
6. Caskie, G.I.L., Sutton, M.C., & Margrett, J.A. (2010). The relation of hypertension to changes in adl/iadl limitations of Mexican American older adults. *Journal of Gerontology: Psychological Sciences*, 65B (3), 296–305, doi:10.1093/geronb/gbq001.
7. Central Bureau of Statistics (1983) thirds population and housing census, , Sudan
8. Central Bureau of Statistics (2008) Fifth population and housing census, Sudan.
9. Chalise, H.N.; Saito, T.; Kai, I. Functional disability in activities of daily living and instrumental activities of daily living among Nepalese Newar elderly. *Public Health* 2008, 122, 394–396.
10. Connolly D, Garvey J, McKee G. Factors associated with ADL/IADL disability in community dwelling older adults in the Irish longitudinal study on ageing (TILDA). *Disabil Rehabil*. 2017;39(8):809–16
11. Department of Economic and Social Affairs. Ageing and disability. UN 2015.
12. DESA, U. N. (2016). Transforming our world: The 2030 agenda for sustainable development.
13. Figaro, M. K., Kritchevsky, S. B., Resnick, H. E., Shorr, R. I., Butler, J., Shintani, A., & et al. (2006). Diabetes, inflammation, and functional decline in older adults: Findings from the health, ageing and body composition (ABC) study. *Diabetes Care*, 29(9)
15. Gregg, E.W., Beckles, G.L., Williamson, D.F., Leveille, S.G., Langlois, J.A., Engelgau, M.M., & Narayan, K.M. (2000). Diabetes and physical disability among U.S. adults. *Diabetes Care* 23:1272–1277.
16. Gregg, E.W., Mangione, C.M., Cauley, J.A., Thompson, T.J., Schwartz, A.V., Ensrud, K.E., & Nevitt, M.C. (2002). Diabetes and incidence of functional disability in older women. *Diabetes Care* 25:61–67.
17. Guccione, A.A., Felson, D.T., Anderson, J.J., Anthony, J.M., Zhang, Y., Wilson, P.W.F., Kelly–Hayes, M., Wolf, P.A., Kreger, B.E., & Kannel, W.B., (1994). The effects of specific medical conditions on the functional limitations of elders in the Framingham Study. *Am. J. Pub. Health* 84, 351–358.
18. HAI (Help Age International; Ministry of Social Planning) (2002) Voices of Older People in Sudan “I am old, I am poor, I am a woman and I am alone.” Khartoum, Sudan: Help Age International Publication.
19. Hairi, N.N., Bulgiba, A., Cumming, R.G., Naganathan, V., & Mudra, I. (2010). Prevalence and correlates of physical disability and functional limitation among community dwelling older people in rural Malaysia, a middle-income country. *BMC Public Health* 10, 492.

20. Ham-Chande, R., A. Palloni and R. Wong 2009 Ageing in Developing Countries: Building Bridges for Integrated Research Agendas. International Union for Scientific Study of Population (IUSSP) Policy and Research Papers.No. 22.
21. Ichiro, T., Yuko, M., Akira, F., Shigeru, H., et al. (1995). Active life expectancy among elderly Japanese. *The Journal of Gerontology*, 50A (3), M173-M177.
22. Jensen, G.L., & Hsiao, P.Y. (2010). Obesity in older adults: relationship to functional limitation. *Curr Opin Clin Nutr Metab Care*. 13(1): 46e51.
23. Kanamori S, Kai Y, Aida J, Kondo K, Kawachi I, Hirai H, et al. social participation and the prevention of functional disability in older Japanese: the JAGES cohort study. *PLoS One*. 2014;9: e99638.
24. Katz S, Downs TD, Cash HR, Grotz RC. Progress in development of the index of ADL. *Gerontologist*. 1970; 1: 20–30.
27. Ng, T.P., Niti, M., Chiam, P.C., & Kua E.H. (2006). Prevalence and correlates of functional disability in multi-ethnic elderly Singaporeans. *J Am Geriatr Soc* 2006 Jan; 54 (1):21-9.
28. Pian Zheng et al ,2021. Prevalence of Disability among the Chinese Older Population: A Systematic Review and Meta-Analysis. *International Journal of Environmental research and public health*.
29. Population Reference Bureau (PRB) 2012 World Population Data Sheet. Washington DC.: PRB.
30. Rakchanyaban, 2004. Active life expectancy among the THAI elderly population United Nations Department of Economic and Social Affairs, Population Division (2002) *Population Ageing 1950–2050*. New York: UN DESA
31. United Nations Department of Economic and Social Affairs, Population Division (2004) *World Population Prospects: The 2004 Revision, Volume III: Analytical Report*. New York: UN DESA. p.23.
32. United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Ageing 2015*. Weeks, J.R. (2012). *An Introduction to Population*. (11th ed.). Cengage Learning: Wadsworth.
33. Wearing, S.C., Hennig, E.M., Byrne, N.M., Steele, J.R., & Hills, A.P. (2006). The biomechanics of restricted movement in adult obesity. *Obes Rev*. 7(1):13e24.
34. Weeks, J.R. (2012). *An Introduction to Population*. (11th ed.). Cengage Learning: Wadsworth.