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RESEARCH ARTICLE

ENVIRONMENTAL AND SOCIO ECONOMIC STATUS FACTORS CAUSING CKD AMONG CHILDREN IN GAZA GOVERNORATES

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ABSTRACT

The human are exposed to several prospect of toxic agents and unstable income conditions in their environments. These agents may be physically, socially, or chemically, that may enter the body through oral, inhalational, or transdermal paths. Several well-known as well as lesser known associations exist between chronic kidney disease (CKD) and physical and social environments agents and conditions, such as living area, toxin wastes, unsafety water, smoking, use pesticides and insecticides, and socio- economic status. The effects of these agents may be modulated by genetic susceptibility and other comorbid conditions and may lead to the developing CKD. This case control study aimed to determine the main risk factors of CKD among children in Gaza governorates (GGs). The sample study consisted of 400 child; 200 cases and 200 controls. The participants were selected from those medical files at Al-Ranteesy hospital while the controls were chosen from the main governmental primary health care centers in each governorate. The result shows significant positive association with living area in camps and villages, living near hazards, and unsafety drinking water was confirmed. The study concluded that most of the risk factors appeared are avoidable. It is found necessary to follow home care, encouraging child health screening for UTI and other urologic problems, controlling of environmental hazard can decrease the risks of CKD in GGs.

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INTRODUCTION

Chronic kidney disease (CKD) is one of the most critical kidney diseases which is considered according to the Center of Disease Control (CDC) an irreversible disease could lead to chronic renal failure that affect the individual health (Center for disease control and prevention (CDC). 2014). It is important to acknowledge the complexity of measuring socioeconomic status (SES) when discussing health disparities. According to many health literatures considered that low SES is a risk factor for CKD, progression to ESRD, and poor health outcomes. After adjusting for age and sex, significantly more likely among individuals with a family income below the poverty line or having less than a high-school education for parents. Individuals with a family history of ESRD also have a decreased GFR, increased albumin-to-creatinine ratio, and a substantially increased risk of progressing to ESRD. At present, the contribution of a shared genetic background to shared familial risk is not known, but the persistence of lower SES as a risk factor in multivariable models for a family history of ESRD suggests a possible gene–environment interaction that should be explored (Patzer and McClellan, 2012). Several studies have documented that increased the incidence of kidney diseases are associated with area-based measures of access to care, range of health services coverage, and the family economy status (Prakash *et al*., 2010). Abu-Odah devised the SES to three parts: low income as 1700 NIS or less, moderate income as 1700-2200 NIS, and high income for more than 2200 NIS per month, the data analysis clarified that the people who live in low income are more risky to ESRD, which mean the incidence of ESRD increased with decreased the average household income (Abu-Odah, 2013). Regarding to Palestinian national accounts, clarified that low SES reflecting the poor life style, and unstable health condition, and this status include large sector of Palestinians in GG (Central Bureau of Statistics, Ministry of Health, 2013). Individuals are exposed to various potentially toxic agents and conditions in their natural and occupational environments. Which include water condition, pesticides, and chemicals toxins that can enter human body through oral, inhalation, or transdermal routes, and may effect on all organ systems, including renal system at kidney with cause nephrotoxicity and kidney damage (US departments of energy, 2012; Soderland

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et al., 2010). A cross-sectional study implicated 460 patients that they diagnosed ESRD in Tabuk, Saudi Arabia to determine the prevalence of ESRD associated with environmental exposures. The study showed that there were around half of patients with ESRD living in rural areas, and many of cases were unknown main causes and it related to environmental factors (El-Minshawy *et al*., 2014). The elements like heavy metals, industrial chemicals toxins, and pesticides are materials that enter the body through oral, inhalation or transdermal routes and effect on all organ system include kidney. The heavy metals like lead and smelters are risk factor in industrial environmental contamination of ground water and may expose people to kidney disease without direct occupational exposure (Soderland *et al*., 2010). A study in El-Minia governorate, Egypt conducted to investigate probability causes of ESRD with unknown causes, the study include 212 cases and 200 control. The result clarified that the prevalence of patient with CKD increase dramatically attributed to environmental factors such as: exposure to pesticide, and drinking unsafe water including wells, home water, and partially filtered water. Moreover, unrecognized environmental toxins or occupational exposures may lead to development and progression of CKD, in addition to the pesticide exposure which could be an environmental risk factor for the development of CKD (Kamel and El-Minshawy, 2010). Second hand smoking (SHS) can be especially harmful on children's health because their lung still are developing, the long-term effect of second hand smoking may cause severe irreversible diseases to children (Center for disease control and prevention (CDC) 2014). SHS cause significant associated with albuminuria, increased risk for CKD in children and adulthood, increased graft loss and progression of renal insufficiency. In children, SHS has been associated with higher blood pressure variability, blood pressure load, elevated c-reactive protein and decreased cognitive function, also evidence linking tobacco exposure to proteinuria in those with and without kidney disease in children and adulthood (Omoloja *et al*., 2014). An observational cohort study of 366 children aged 1-16 years with CKD, the study cleared that many of the participants were exposed to SHS, the prevalence of nephrotic syndrome and proteinuria range were higher in children exposed to SHS compared to those unexposed (Omoloja *et al*., 2013).

MATERIALS AND METHODS

The study is a quantitative retrospective (case-control study). The study was carried out at Abd El-Aziz Al-Ranteesy specialized pediatric hospital (RSPH) Nephrology and Hemodialysis Departments for patients of CKD for cases, and governmental primary health care clinics for controls as it cleared in table. The researcher choose these clinics as the largest clinics in each governorate and also because it is located in the middle of the governorate. A systematic random sample consisted of 200 patients (cases) diagnosed with CKD and receive care in the different settings of RSPH and 200 (controls) from children who take care in the outpatient primary health care clinics of the Ministry of Health in Gaza Governorates (GGs). The control group has had no history of CKD. Control and cases participants were ≤ 12 years old and each one cases versus one control in the same age group, gender and governorate, and agree to participate in the study. The outpatient clinics chosen from ministry of health according the main health center in each governorate in GGs as appear in table (1.1). The sample size was calculated at 95% confidence level with confidence interval 5 and total population 410. The sample size needed was 199 case. According to this process, the researcher decided to include 200 cases from RSPH in his study. Data collection started in middle of February 2015 and continued to mid of May 2015. Data entry, analysis and writing the final report continued till August 2015. The data collected from the participants by using a structured questionnaire through face to face interview. Data entry using Statistical Package for Social Sciences (SPSS) version 20 was adopted. Numerical Data were expressed as means, medians and standard deviations. Qualitative data were expressed as frequency and percentage. Other tests such as t test, and regression were used to examine the relationship between certain risk factors and others and with the incidence of CKD among children in GGs. Results were expressed as frequency or mean ± standard deviation. The results were statistically significant when Confidence Interval (CI) = 95% and p-value= 0.05 or less.

RESULTS

Table (1) compares the 200 cases with the 200 controls matched with sex, age, and locality. Among the selected cases, the researcher found the distribution of CKD among study population were males (57.0%) and female (43.0%). These results were consistent with Hsu *et al*., (2014)study results, determined that male was represented 64.7% while female 35.3% of the cases population (Hsu et al., 2014). Furthermore, the prevalence of CKD for males and females were 52.1% and 47.9 respectively (Ceron et al., 2014). Compared with Staples *et al*., (2010), the prevalence of CKD among males was higher than females with 61.5% and 38.5% respectively. These results support the results of this study which concluded that the exposure to CKD is higher in males than females. There were also regional differences in cases, where the highest prevalence was in Gaza city (57.0%) and the lowest percentage was in Rafah and Khan-Younis (9.0%). This distribution is corresponding to the population differences in the Governorates, where one-third of the population is living in Gaza city. The researcher supposed that the percentage of incidence in cases were high in Gaza governorates because of qualified nephrologist to diagnose and recording the new cases in database and monitor the disease and determine the stage of CKD in pediatric hospitals.

Table 1. Demographic characteristics of the study population

Variables	Cases		Controls	
	No	%	No	%
*Sex				
Boy	114	57.0	114	57.0
Girl	86	43.0	86	43.0
*Age group				
< 2 years	18	9.0	18	9.0
2-5 years	60	30.0	60	30.0
> 5 years	122	61.0	122	61.0
*Locality				
North Gaza	28	14.0	28	14.0
Gaza	114	57.0	114	57.0
Deir AL-Balah	22	11.0	22	11.0
Khan-Younis	18	9.0	18	9.0
Rafah	18	9.0	18	9.0

*Matched variables

Furthermore, the prevalence of CKD disease increases continually with age with approximately61.0% of all CKD cases have an age of more than 5 years more than younger children.

designs, preventing any speculation regarding the significance of the researcher results. For the relationship between CKD and sources of drinking water in the total population, the researcher observed that the municipal water as source of drinking water

Table 2. Comparison between the participants by: smoking exposure, using insecticide or pesticides at home, type of drinking water, and monthly income

Variables	Cases		Controls		Total		OR (95% CI)	P value
	No	%	No	%	No	%		
Exposed to smoking								
Yes	100	50.0	88	44.0	188	47.0%		
No	100	50.0	112	56.0	212	53.0	1.27 (0.85-1.88)	0.229
Total	200	100	200	100	400	100		
Use insecticide or pesticides								
Yes	134	77.0	156	88.0	290	72.5		
No	66	33.0	44	22.0	110	27.5	0.57 (0.36-0.89)	0.013
Total	200	100	200	100	400	100		
Type								
Insecticides home	100	50.0	93	46.5	193	48.3	0.7 (0.44-1.15)	0.16
Anti-mosquito	22	11.0	42	21.0	64	16.0	0.34 (0.18-0.66) \	0.001
Pesticides	12	6.0	22	11.0	43	10.7	0.36 (0.16-0.8)	0.01
Not used	66	33.0	44	22.0	110	27.5		
Total	200	100	200	100	400	100		
Sources of water								
Municipal	22	11.0	8	4.0	30	7.5	2.93(1.26-6.76)	0.008
Well	10	5.0	13	6.5	23	5.8	0.8(0.35-1.91)	0.64
Auto mobile filter	168	84.0	179	89.5	347	86.7	1	
Total	200	100	200	100	400	100		
Household income (NIS)								
< 1700	118	59.0	125	62.5	243	60.7	.69(0.39-1.23)	
1700-2200	48	24.0	50	25.0	98	24.5	1.41(.69-2.86)	0.446
> 2200	34	17.0	25	12.5	59	14.8	1	
Total	200	100	200	100	400	100		

Table (2) shows that 50.0% out of the total cases has exposed to smoking compared to 47.0% out of the total controls. The study indicated that there was no a statistical association between exposure to smoking and CKD occurrence. This result of the study did not agree with the results of a study conducted by Omoloja *et al*. (2014) and found that the child with SHS is associated with risk factor to renal problems which that lead to CKD in children with an OR 2.64, (95 % confidence interval 1.08, 6.42). From the same table, it shows that 77.0% out of the total cases had exposed to insecticide and pesticide at home compared to 88.0% out of the total controls. This difference was close to, but indicated that there were negative associations between using insecticide at home or local area and CKD occurrence (OR=0.57, 95% CI=0.36-0.89, P value= 0.013). Study limitations and the complexity of assessing pesticide exposure from multiple sources prevent drawing definitive conclusions.

The literature contains few studies examining the relationship between pesticide exposure and CKD in children. A study held out by Soderland *et al*, and US department of energy illustrated that the industrial chemical toxins, insecticides, and pesticide can absorbed by inhalation or the body skin and cause damage at all internal organs (US departments of energy (2012); Soderland *et al*., 2010). Other study from El-minia, Egypt conducted to correlate the relation between the environmental factors and ESRD among population conclude that the study participants exposed to pesticides and environmental toxins for long time in their life before the disease (Kamel and El-Minshawy, 2010). These studies are small and have limited among cases was higher than controls (11.0% - 4.0% respectively). The association between CKD and source of water is statistically significant level with CKD among children (P-value= 0.008). Compared with previous studies reported that there were a high rate of the participants whom used unsafe water such as municipal water and ground filtered water were reported by 72% and 48% respectively. Additionally, another study showed that the contaminated ground water with heavy toxin metals could be increase the risk factor for ESRD among people. That mean the potable water in GG is not considered a safe source for drinking water, and possible lead to health problems in renal system. From the same table shows that more than half of the participants live in unstable economic situation and under extreme poverty line for the reference with approximately 1,700 shekels per month. The results show that there is no statistically significant difference between the case and control groups in term of the socio economic status with P-value 0.446. The results of the study has led to confusion but the researcher could contribute these results to the difficult and unstable economic status, the high unemployment rate and to the large number (61%) of people who live under the poverty line in GGs (Central Bureau of Statistics, Ministry of Health, (2013)). These resultswere not compatible with these of other studies which indicted that poorSES has a negative effect on family health status especially children, which bind genetically with environmental factors and causes CKD in the children (Patzer and McClellan, 2012). Abu-Odah, (2013) clarified that the individuals who live in low monthly income are more likely to risk of ESRD (Abu-Odah, 2013).

Table 3. Comparison between children with and without CKD related to living area and home roof

Variables	Cases		Controls		Total		OR (95% CI)	P value
	No	%	No	%	No	%		
Living area								
City	128	64.0	157	78.5	285	71.5	1	
Camp	58	29.0	32	16.0	90	22.0	2.22 (1.36-3.63)	0.005
Village	14	7.0	11	5.5	25	6.5	1.56 (0.68-3.55)	
Total	200	100	200	100	400	100		
Home roof								
Concrete	144	72.0	155	77.5	299	74.7	1	
Asbestos	38	19.0	27	13.5	65	16.3	0.66 (0.38-1.13)	0.332
Other	18	9.0	18	9.0	36	9.0	0.92 (0.46-1.85)	
Total	200	100	200	100	400	100		
Living near hazards								
Yes	122	61.0	103	51.5	225	56.3		
No	78	39.0	97	48.5	175	43.7	1.47 (0.99-2.19)	0.050
Total	200	100	200	100	400	100		
Type of hazards								
Sewage	12	6.0	22	11.0	34	8.5	0.67 (031-1.45)	0.31
Landfill	34	17.0	19	9.5	53	13.3	2.2 (1.17-4.20)	0.012
Animal farm	60	30.0	47	23.5	107	26.7	1.58 (0.97-2.58)	0.06
Others	16	8.0	15	7.5	31	7.6	1.32 (0.61-2.85)	0.46
No	78	39.0	97	48.5	175	43.7		
Total	200	100	200	100	400	100		

Also, Parkash *et al*. (2010) illustrated the association between low SES and the high incidence of CKD (Prakash, 2010). The researcher conclude that the SES could be one of the health indicators that effects the child health status negatively at all population. Concerning the relationship between living area and CKD, table above shows that 29.0% of cases were living in camp compared with 16.0% of controls were living in camp. Moreover, the relationships between living in camp and CKD shows strong positive association (OR=2.22, 95% CI- 1.36-3.63, P value= 0.005). This result agree with a study conducted in Tabuk, Saudi Arabia which demonstrates the prevalence of ESRD in children increase in rural areas than urban. The study showed that there were 55% of patients living in rural areas, and 33% of cases were unknown main causes and it related to environmental factors (El-Minshawy *et al*., 2014). Clearly, the researcher can conclude that the living near environmental hazards or contaminated areas canincrease the risks occurrence CKD in children. Furthermore, this table indicated that there were not statistically associations between home roof and occurrence of CKD. The study indicates that 56.3% of all study participants' were lived near environmental hazards. It was observed that 122 cases that equal 61.0% out of the CKD cases were lived near environmental hazards compared to 51.5% of controls. Living near landfills was the most environmental hazards that effect on the population with statically significant among cases and controls with p-value 0.012. The association between environmental hazards and CKD occurrence reached statistically significant level (OR= 1.47, 95% CI=0.99-2.19, P value= 0.050). The researcher found that the risk of live near landfills and municipals wastes can effect on child health status negatively and predisposing factor for CKD.

Conclusion

According to the results of this study, the researcher can conclude that different risk factors could affect the health status of the children in GG and lead to CKD and are not the same risks with adults. These factors include, socio-economic and demographic, and environmental factors. The researcher can conclude that the reduction of these risk factors such as control of chronic diseases, management of high risk environmental hazards and enhancing social and finance insurance for poverty families will help in reducing the incidence and prevalence of children with CKD in GG.

Recommendations

1. Conducting a community health campaign to support low income areas about the risks of unstable income on population health.
2. Increasing attention about environmental hazard including unsafety water especially municipal water, and living near contamination places.
3. Further studiesare needed to understand the effects of multiple insecticides and pesticide exposures on kidney function in children.
4. Implementing further studies to investigate other emerging CKD factors, such nutrition factors, other environmental factors that increase the risks of CKD among child, and outcome of the disease at children and their families.

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