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The Influence of Policies and Programs on Cause-Specific Mortality in Egypt: The Past and Present

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Abstract: ***Egypt implemented policies and programs to minimize the factors that promote the occurrences of cause-specific mortality. The impact of the policies and programs on the cause-specific mortality and health of Egyptians is not well understood. Thus, the study assessed death rates in Egypt before and after the execution of policies and programs to reduce cause-specific mortality from 2000 to 2015.The study estimated standardized death rates from specific causes of death among females and males in Egypt for a period of 16 years. The study revealed the variance in the mortality experiences of males and females after and before the implementation of the policies and programs. Mortality from diarrhea decreased after the introduction of universal health coverage program but mortality from stroke increased after the implementation of the tobacco policy in Egypt. Many programs and policies executed in Egypt failed to contain the influence of determinants of mortality on cause-specific mortality in Egypt. Thus, policies and programs should target all populations exposed to the risk of cause-specific mortality as well as be reformed to tackle conditions with an increased mortality.***

Keywords: Cause-Specific Mortality, Policies, Programs, Egypt

1. Introduction

Egypt has implemented several policies and programs to improve the health of its citizens [1]. These initiatives target specific conditions such as cause-specific mortality which challenge the acquisition of good health [2]. These causes of death range from infectious diseases to external causes [3]–[6]. A mutation in some of these causes influences the onset of other causes of mortality [7]. For instance a shift from type 1 to type 2 diabetes increases the chances of fatality from stroke [8]. Nonetheless, these conditions concur with behavioral factors such as smoking, alcohol consumption, unnecessary risk-seeking, unsafe sex, poor dietary habits, and sedentary lifestyle [9]. Also, structural challenges including esoteric health care, social injustice, poor infrastructure, and weak surveillance coincide with these conditions [10], [11].

2. Literature Review

Over 47% of the male population of Egypt aged 15 years and above living in Egypt smoke tobacco. About 5% and 34% of the female and male population of Egypt smoke and use tobacco daily[12], [13]. Approximately, 22.5% of all Egyptians consumed alcohol in 2005. Mortality from road-traffic injuries (RTIs) equated about 2.8% of all mortality that occurred in Egypt in 2004. From 2002 and 2009, falls became the leading cause of injuries in Egypt with RTIs ranking second. The prevalence of the former was higher among malesthan females. It was estimated to be 73.5% and 26.5%, respectively. Similarly, injustice within the healthcare system widened the gender gap in mortality in the country [11]. It further promoted the doubling of Human Immunodeficiency Virus (HIV) incidence such that in 2007 Egypt incurred 73.8% of all HIV incidence in the Middle East[14]. These experiences necessitated the reforms [15].

Since 2005, Egypt adopted the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) to control the use of tobacco and reduce its related mortality defining conditions [16]–[18]. In 2005, taxes on soft drinks were reduced from 65% to 25% to boost the intake of non-alcoholic beverages over alcoholic drinks [19]. It was complemented with the sales of alcohol for persons age 21 and above years [20]. Road safety rules and infrastructural development schemes (roads) implemented in 2007 in Egypt work to reduce fatalities from RTIs [21]. In 2006, Egypt and other countries adopted the Maputo Plan of Action (MPoA) to advance universal access to comprehensive sexual and reproductive health services [22]. Also, the universal health coverage initiative was executed to bridge the health gap between the marginalized and affluent groups in society [11]. Further, the country launched national Hepatitis C Virus (HCV) treatment program as a means of reducing its prevalence and fatality [23].

Esser & Jernigan [24] indicated that despite the strategies to curb alcohol consumption and its related mortality, the sales of alcohol is less restrictive in Egypt. In 2008, the cost of RTIs in Egypt increased to approximately 10 billion Egyptian Pounds although it was expected to have decreased given the policies to curb its cost [25]. Further, RTIs, falls and other external causes continues to proliferate mortality in Egypt [26]–[28]. Also, mortality from HIV and hepatitis appears to be pelting especially among the most at risk populations in Egypt [14], [23]. However, these authors did not adequately investigate the gender variations in the prevalence of cause-specific mortality to policies and programs created and implemented. Therefore, the study assessed how policies and programs had influenced the gender variations in the prevalence of cause-specific mortality at distinct periods in Egypt.

3. Methods

3.1 Data Sources

The study used data from the World Health Organization (WHO) Mortality Database and the United Nations Population Division. These sources provided data on cause-specific mortality and population size from 2000 to 2015.

Cause-specific mortality from infectious, neoplasms, circulatory, respiratory, endocrine and digestive diseases, nervous, blood and blood-forming organs and certain disorders involving the immune mechanism, congenital malformations, deformations, and chromosomal abnormalities and external causes of morbidity and mortality and other causes was the focus. These mortality defining conditions followed the International Classification of Diseases 10th revision (ICD 10) [29] (see Table 1). These causes of death chosen due to their identification as the most virulent causes of death in Egypt[12]–[15], [27], [28], [30]

3.2 Ethical Statement

The study sort no ethical approval from the author's institution since the data employed for the study had no identifiers.

3.3 Data Analysis

The study consisted of a retrospective explorative temporal analytical phase. The approach aided with the understanding of the pattern of cause-specific mortality over time and the gender variations in these causes of death [31].

As part of the design, age-standardized death rates were estimated for males and females from 2000 to 2015. Age groups with a five-year interval were generated for all causes at ages 0 to 75 and above years to produce meaningful samples [32]. The study linked the reported number of death from a specific cause in each age group to a specific WHO World population standard value to directly standardize the death rates in each age group [33]. It further reduced variability and effect of age composition on the outcome of the analysis [34], [35]. Therefore the standardized death rates (SMR) were estimated using the formula;

$$SMR = \frac{\sum_{k=0}^{n} {}_nP_k * {}_nM_{ktx}}{\sum_{k=0}^{n} {}_nP_k} \quad (1)$$

where ${}_nP_k$ is the WHO predefined standard population in an age group (k) and ${}_nM_{ktx}$ the age specific-death rates for males and females at a particular time (t) and from a specific cause of death (x) in the age interval (k).

Also, there was an estimation of the percentage change in the SMR from all the causes of death under study from 2000 to 2015. The analyses were conducted using R.

4. Results

Table 1 shows the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD 10) categories of diseases selected as cause-specific mortality for the study. Out of the ten (10) broad clusters of causes of death, seventeen (17) causes were employed in the study. These became diarrhea, hepatitis, HIV and tuberculosis, neoplasms (cancer), congenital defects, diabetes, hypertension, ischaemic heart disease (IHD), stroke, lower respiratory disease (LRD), pneumonia, chronic obstructive pulmonary diseases (COPD) cirrhosis, RTIs, falls, burns and poisoning were the causes of death studied.

Table 1: Selected Causes of Mortality for the Study

Causes of Death	ICD 10 Code
Certain Infectious and Parasitic	
Diarrhoea	A09
Hepatitis	B15-B19
HIV and Tuberculosis	B20-B24, B90, A15-A19
Neoplasm	
Neoplasms (Cancer)	C00-D48
Blood and Blood-Forming Organs and Certain Disorders Involving the Immune Mechanism Endocrine, Nutritional and Metabolic Nervous System Congenital malformations, deformations and chromosomal abnormalities	
Congenital Defects	D66-D67, E00, G60, Q00-Q99
Endocrine, nutritional and metabolic	
Diabetes	E10-E16
Circulatory System	
Hypertension	I10-I15
IHD	I21-I25
Stroke	I64
Respiratory System	
LRD	J20-J22, J40-J42
Pneumonia	J12-J18
COPD	J43-J44
Digestive System	
Cirrhosis	K74-K77
ExternalCauses of Morbidity and Mortality	
RTIs	V01-V019
Falls	W00-W20, W68-W70, W77, Y30-Y31
Burns	X00-X09
Poisoning	X40-X49,X60-X69,Y10-Y19

Source: WHO Mortality Database, 2018

Figure 1 illustrates the distribution of mortality from specific causes by the gender from 2000 to 2015. The Standardized Mortality rates (SMR per 100000) among males and females in Egypt varied over time and among the causes of death under study. Generally, females recorded lower mortality rates than males from 2000 to 2015. Cancer, cirrhosis, hypertension, IHD, and pneumonia (20 to 80) were the leading causes of mortality among both sexes although males observed higher mortality than females. While many males than females experienced RTIs, many females than males died from diarrhea. Other causes of mortality such as stroke, hepatitis, and diabetes caused more deaths among males than among females (see figure 1).

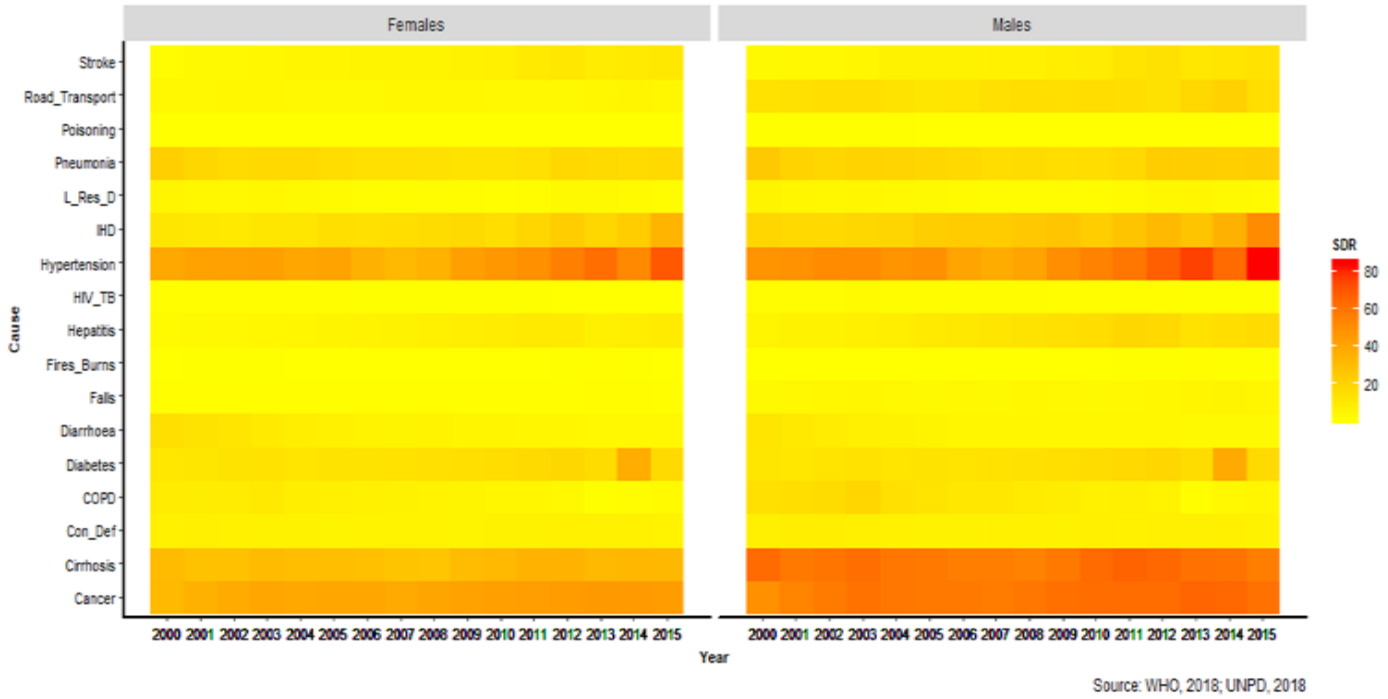


Figure 1: A Heat Map of the Standardized Mortality Rates (SMR) among Males and Females in Egypt from 2000 to 2015

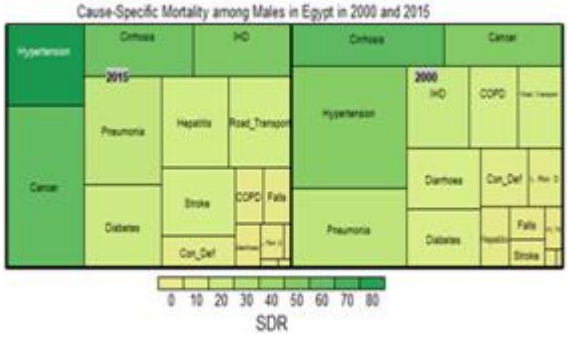
Table 2 shows the estimated SMR (per 100000) for the causes of death understudy for Egypt in 2000, 2005 and 2015. The leading causes of mortality in Egypt varied by gender and over time. Before the implementation of policies (the year 2000), males, in particular, had highest (63.1) and lowest (0.3) mortality rates from cirrhosis and burns as compared to females who incurred highest (39.4) deaths from hypertension and lowest (0.3) burns and poisoning, respectively. At the policy implementation period (2005), the predominant and lowest causes of mortality among males were cancer and cirrhosis (58.4) and burns (0.2) although females sustained highest deaths from hypertension (41.5) and lowest mortality from poisoning (0.2). Ten years after the implementation of the policies (2015), hypertension, the leading cause of mortality among women increased to about 69.1 per 100000. However, males experienced sudden shift from cirrhosis to hypertension (83.9) as the leading cause of death.

Table 2: Standardized Mortality Rates (SMR) among Egyptians in 2000, 20005 and 2015

	Females			Males		
	Rates per 100000			Rates per 100000		
Causes	**2000**	**2005**	**2015**	**2000**	**2005**	**2015**
Diarrhea	14.8	6.4	3.5	12.1	5.3	3
Hepatitis	2.4	5	9.2	4.6	10	16.7
HIV&TB	0.9	0.8	0.3	2.0	1.7	0.7
Cancer	31.7	39.7	44.1	48.8	58.4	61.1
Diabetes	11.1	13.1	17.1	11.5	13.2	17.3
Hypertension	39.4	41.5	69.2	47.7	49	83.9
IHD	11.8	14.8	33.6	19	22.6	51.1
Stroke	2.0	4.8	10.6	2.7	6.3	13.6
LRP	4.9	2.4	1.6	5.4	3	2.3
Pneumonia	21.9	15.9	17.4	24.8	18.5	22.5
COPD	8.8	7.6	2.2	14.6	12.7	4.3
Cirrhosis	31.1	29.7	32.2	63.1	58.4	56.5
Con-Def	6.5	5.4	5.8	7.4	6.3	6.3
RTIs	3.4	3.1	3.6	13.5	11.8	15.3
Falls	0.9	0.9	1.1	3.1	3	4.2
Burns	0.3	0.3	0.3	0.3	0.2	0.4
Poisoning	0.3	0.2	0.3	0.6	0.3	0.3

Abbreviation: Con-Def=Congenital defects, TB= Tuberculosis.
Source: WH0, 2018, UNPD, 2018

Figure 2 depicts the changes in the order of cause-specific mortality among males and females from 2000 to 2015. Generally, males and females had differing cause-specific mortality experiences although these causes of death formed part of the similar broad clusters. Cirrhosis, cancer, hypertension, IHD, COPD, pneumonia, and RTIs were, in descending order, the leading causes of mortality for males in 2000. In the same year, hepatitis falls, stroke, HIV&TB, poisoning, and burns were the least recurring form of cause-specific mortality among males. By 2015, hypertension, cancer, cirrhosis, IHD, pneumonia, diabetes, hepatitis, and RTIs remained the leading cause of mortality with diarrhea while LRD, HIV&TB, poisoning and burns became the least causes of death for males. Among females, hypertension, cirrhosis, cancer, pneumonia, diarrhea, and IHD were, in descending order, the leading causes of mortality in 2000. Stroke, falls, HIV&TB, poisoning, and burns caused the lowest mortality among females. By 2015, hypertension, cancer, IHD, cirrhosis, pneumonia, diabetes, and stroke remained the leading cause of mortality with LRD, falls, HIV&TB, poisoning, and burns causing the lowest of death for females.



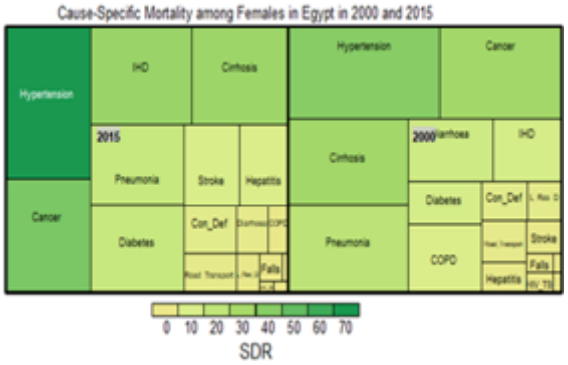


Figure 2: Cause-Specific Mortality among Egyptians at the Beginning and End Periods of Study

Table 3 shows the percentage difference in the rate of cause-specific mortality from 2000 to 2015 among Egyptian males and females. The rate of change in cause-specific mortality was not uniform. The variance was cause and sex-specific. While some causes observed a decreased rate of change in mortality, certain causes incurred an increased rate of change. Mortality from diarrhea sustained a highest decreased rate of change for all sexes but the variance was higher among females (v=11.3, 76%) and males (v=9.1, 75%). On the contrary, stroke had the highest increase in the difference in mortality rates for males (v=10.9, 404%) and females (v=8.6, 430%) although the variation in mortality was relatively higher among females than among males. Similar, mortality rates from hepatitis, cancer, diabetes, hypertension, IHD, RTIs, falls and burns increased over time.

Table 3*: Rate of Change in Standardized Mortality Rates (SMR) Stratified by Gender in Egypt*

	Females		Males	
Causes	**V**alue (V)	Change (%)	**V**alue (V)	Change (%)
Diarrhea	-11.3	-76	-9.1	-75
Hepatitis	6.8	283	12.1	263
HIV&TB	-0.6	-67	-1.3	-65
Cancer	12.4	39	12.3	25
Diabetes	6.0	54	5.8	50
Hypertension	29.8	76	36.2	76
IHD	21.8	185	32.1	169
Stroke	8.6	430	10.9	404
LRP	-3.3	-67	-3.1	-57
Pneumonia	-4.5	-21	-2.3	-9
COPD	-6.6	-75	-10.3	-71
Cirrhosis	1.1	4	-6.6	-10
Con-Def	-0.7	-11	-1.1	-15
RTIs	0.2	6	1.8	13
Falls	0.2	22	1.1	35
Burns	0.0	0.0	0.1	33
Poisoning	0.0	0.0	-0.3	-50

Abbreviation: Con-Def=Congenital defects, TB= Tuberculosis.
Source: WH0, 2018, UNPD, 2018

5. Discussion

Many policies and programs have been implemented for the reduction of mortality from the 17 causes of death above; however, most of these causes remain a burden in Egypt. It is worth mentioning that this is the first study to analyze the influence of policies and programs on the leading causes of death among Egyptians. The study revealed that the progress in the reduction of cause-specific mortality was not equal among males and females and over time, which in part is driven by risk factors for which policies and programs were implemented. The findings of the study, therefore, correspond to those of Mahran, et al. [30] which indicated a gender gap in morbidity and mortality in Egypt. Moreover, the mortality burden from hepatitis, hypertension, IHD, diabetes, stroke, cancer and RTIs is an increasing public health challenge despite the existing policies to control its mortality. Thus, Bos and Agyemang [4], Mandil et al. [6], Scharf and DeBoer [8], EL-Din et al. [10], Kouyoumjian et al. [23] documentations that mortality from hepatitis, hypertension, IHD, diabetes, stroke, cancer and RTIs are the most common causes of mortality in Egypt is affirmed in the study.

Among all policies and programs targeted at the reduction of mortality, diarrhea-related mortality reduction programs and policies have been the most effective. Much of the initiatives to tackle social injustice and poor healthcare access and utility has been focused on vulnerable groups, like women and children. These groups of people, particularly under-five children, often fall victims of death from diarrhea. Thus, the reduction of mortality from diarrhea as a result of initiatives such as the Global Action Plan for the Prevention and Control of diarrhea among such groups influenced the overall reduction in death from such causes in Egypt [11], [36]. Policies targeting risk factors of stroke have been the least effective in Egypt. The study revealed that stroke gained the highest increase in mortality under the implementation of policies of its prevention. It further suggests that certain interventions had malicious effects on the mortality from specific causes in Egypt. Clocking the soft drink tax intervention which worked as a disincentive to alcohol consumption in Egypt, it might have increased the intake of soda and other sugar-sweetened beverages. These beverages and poor dietary habits increase the onset of diabetes, which is a risk factor for stroke. Hence, the increase in diabetes cases further increased the mortality from stroke [3], [5], [8], [10], [19]. Similarly, the HCV treatment program has been less effective at tackling mortality from hepatitis considering the increase in the rate of death from hepatitis. Mortality from hypertension observed a similar percentage increase among the sexes. This finding suggests that the WHO FCTC policy and the legal age for alcohol acquisition program was ineffective at controlling the alcohol as a primary driver of hypertension and its related mortality. Possibly, the less restriction of the sales of alcohol to persons despite the legal age for its acquisition is a reason for the ineffectiveness of the initiative on alcohol and hypertension in Egypt [24].

Mortality from hepatitis progressed among females than among males in Egypt although Gomma et al. [37] posit hepatitis has been prevalent among males than females in Egypt. The Maputo Plan of Action (MPoA) devoted to universal access to comprehensive sexual and reproductive health services initiative in Egypt also worked to reduce HIV and TB mortality though females other than males benefitted the most [22]. This finding is contrary to Shawky et al.[14] postulations that the prevalence of HIV in Egypt pelts

among the susceptible groups like Egyptian women. That said, a reasonable resolution was the execution HIV and TB mortality reduction schemes for specific target populations which worked towards the achievement of improved health among that populace [17]. Consequently, the rate of increase in mortality from HIV and TB decreased among females than among males as males were not the target group.

The variance in the rates of change of mortality from hepatitis among males and females further corroborate the levels of mortality from cirrhosis. It attests the fact the onset of some diseases influence the emergence of other diseases [38]. Males recorded more death from RTIs and falls than females as hypothesized by Mahran et al. [30]. However, the findings of the study suggest that since the year 2000, the occurrence of mortality from RTIs supersede mortality from falls in Egypt. This counters Mahran et al. [30] report that from 2002 to 2009 falls as compared with RTIs were the leading cause of injuries in Egypt. Again, the road safety measures and infrastructural development schemes designed to reduce mortality from RTIs in Egypt has not been effective given the current rise in mortality from RTIs in the country [21].

6. Conclusion

In conclusion, the study shows that despite the implementation of policies and programs to reduce cause-specific mortality, the mortality burden from such diseases persists. Although diarrhea, HIV and TB and COPD were less endemic in the initial periods, hepatitis, IHD, stroke, cancer, hypertension, and diabetes were still burdensome in Egypt. Thus, the programs and policies targeted at specific behavior affecting the leading cause of mortality in Egypt should be reformed and executed correctly. Furthermore, there should be a continued prioritization of programs for all populations exposed to the risk of cause-specific mortality. Interventions could include specially designed schemes for males and females which intend leads to the achievement of similar cause-specific mortality reduction goals.

The study has several limitations. The quality of cause-specific mortality data has been challenging for Egypt after the year 2010. However, the application of the direct standardization method using the WHO standard population reduced the effect of the quality of data on the results of the analyses. The implications of this limitation call for improved vital registration systems and surveillance methods including standard reporting procedures which reduces the uncertainty in cause-specific mortality in Egypt. The study failed to discuss the programs and policies in detail. It was because the focus of the study was on how these policies and programs have changed cause-specific mortality studied than their execution processes.

7. Author's Contribution

SSS conceived and performed the analyses of the study. SSS drafted and edited the manuscript. The author proof-read the final manuscript and approved it.

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