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## RESEARCH ARTICLE

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# THE EPIDEMIOLOGY OF NATURAL DEATHS IN GUYANA: CARDIOVASCULAR DISEASE, DIABETES AND THE AGEING POPULATION

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## ABSTRACT

**Objective:** This retrospective cross-sectional study analyzed autopsy records (2018–2023) from Guyana's sole referral hospital to identify leading causes of natural deaths, with emphasis on diabetes and elderly populations. **Methods:** Data from 10,975 autopsies were analyzed using SPSS v23. Natural deaths ( $n=6,694$ ) were categorized by etiology, with subgroup analyses for diabetics ( $n=1,798$ ) and elders  $\geq 60$  years ( $n=2,180$ ). **Results:** Cardiovascular diseases accounted for 51.2% of natural deaths, followed by respiratory infections (20.2%) and cerebrovascular events (13.5%). Among diabetics, 61.5% died from cardiovascular causes, exceeding global averages. Elders exhibited similar trends, with 51.8% cardiovascular-related mortality. **Conclusion:** The disproportionate burden of preventable cardiovascular deaths in Guyana underscores urgent needs for targeted primary prevention and interdisciplinary diabetes care, particularly in low-resource settings.

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## INTRODUCTION

An autopsy or post-mortem examination is a medical investigation performed by pathologists to determine the cause of death of a person. Hospital autopsies are conducted on hospitalized patients who died of natural causes. Natural causes of death are those due to internal factors, ranging from malignancies to cardiac diseases to diabetes. Forensic autopsies, on the other hand, investigate violent or allegedly violent cases (WHO, 2016). Besides investigating causes of death, the value of a post-mortem examination lies in monitoring public health, i.e., through epidemiological and research purposes to help health authorities determine their focus for public health actions. For example, a high incidence of diabetes-related deaths could encourage spending on treatment, prevention methods, and awareness campaigns. Autopsies also contribute to the calculation of the death rate per thousand and crude death rate, both of which have steadily increased in Guyana from 2013 to 2016. Additionally, autopsies are necessary for medicolegal purposes. To sum up, knowledge of the number of deaths and the reasons people die is critical in assessing the effectiveness of a country's health system (Roth et al., 2020; Einarson et al., 2018). According to Drake (2019), 70% of adults who died of natural causes had not seen a healthcare provider in the last 30 days prior to their death. In addition, these persons lived in medically underserved and impoverished communities. Most importantly, there was a lack of access to healthcare services. Essentially, these patients were dying from treatable and preventable diseases.

As of 2016, the leading causes of death for 56.9 million persons worldwide in descending order according to the World Health Organization (WHO) are ischemic heart disease, stroke, and chronic obstructive pulmonary disease (COPD) (WHO, 2016). This gives the world an idea of how persons are likely to die from specific pathologies and encourages the implementation of stringent treatment and preventative measures that would improve population health. According to WHO (2016), diabetes was estimated to be the seventh leading cause of death in 2016. The barriers to optimal glycemic control and largely undiagnosed disease burden continue to make diabetes a very challenging medical condition. Diabetes-related deaths showed a drastic increase from less than a million in 2000 to 1.6 million in 2016. Another 2.2 million deaths were attributable to high blood sugar in 2012. Statistics from WHO elicited that the number of persons living with diabetes has almost quadrupled from 1980 to 2014 (WHO, 2016). In addition, the global prevalence of adults over 18 years living with diabetes has almost doubled from 1980 to 2014 (WHO, 2016). Middle- and low-income countries have been shown to have a rapidly increasing prevalence of diabetes. Hence, this may lead to serious medical conditions such as blindness, end-stage renal failure, and non-traumatic lower limb amputation. In order to improve health in low- and middle-income countries, there must be systems in place to collect information on the causes of death. These data can then be utilized to build prevention campaigns and bring awareness to the population. Ideally, diabetes should be managed by an endocrinologist. However, low- and middle-income countries may not have such specialties in abundance or at all.

Dagogo-Jack (2002) highlighted that most patients with diabetes were routinely treated by healthcare providers who are not endocrinologists but rather internists and family practice physicians. The research identified eight strategies for preventing or reducing diabetes-related morbidity and mortality: provider education; patient empowerment through promotion of lifestyle and self-care practices; surveillance for microvascular complications; cardiovascular risk reduction; efficient use of medications; goal setting; stratification of patients; and triaging those with poor glycemic control for more intensive management. Bluml *et al.* (2014) sought to improve key indicators of diabetes care by integrating pharmacists into local interdisciplinary diabetes care teams to provide diabetes education and medication consultations. The outcome of this intervention showed a statistically significant and clinically relevant decrease in mean A1C levels (-0.8%). This research demonstrated that patient-centered interdisciplinary healthcare teams that included pharmacists lead to improvements in patients' clinical outcomes, even among those facing barriers to appropriate diabetes care. Statistical data on death rates and etiology are vital means for assessing the effectiveness of a healthcare system within a country (Roth *et al.*, 2020). These data provide insights into how diseases affect certain populations and their extent. Cause-of-death statistics can serve as guidelines for health authorities making vital public health decisions (Roth *et al.*, 2020). Thus, diabetes is a considerable cause of premature mortality. This situation is likely worsening as diabetes prevalence increases. This is particularly so in low- and middle-income countries. Investments in primary and secondary prevention are urgently required to reduce this burden.

## METHODS

This study was a retrospective cross-sectional study which used a quantitative design. The Georgetown Public Hospital Corporation (GPHC) Pathology Department was chosen to conduct this study because it is the facility that must investigate all deaths occurring in Guyana, and the only government pathologist is employed there. Additionally, GPHC is the only referral hospital in the country. With permission from the GPHC Pathology Department, the autopsy records for 2018- 2023 were accessed for both hospital deaths and forensic deaths. This classification is for deaths that occur in hospital and deaths that occur out of hospital. The analysis of the data was done using Statistical Package for Social Sciences (SPSS) version 23.

## RESULTS

A total of 10975 recorded autopsies were analyzed for the period of 2018 to 2023 at the GPHC Pathology Department. Of those records, 6,694 cases died as a result of natural causes (M 4,083, F 2,611). Among the total number of natural deaths, there were 1,798 (16.4%) diabetics and 2,180 (19.8%) elders - individuals who were 60 years or older.

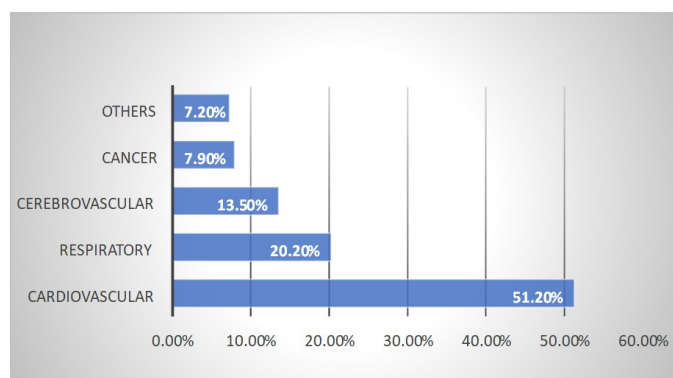


Figure 1. Causes of Natural Deaths

Figure 1 shows the 51.2% of all natural deaths was cardiovascular in nature, 20.2% was respiratory (infectious) in nature, 13.5% was cerebrovascular while 7.9% was cancer related. 7.2% of the analysed

data was grouped as 'others' encompassing hepatic (non-digestive), respiratory (non-infectious), and digestive causes.

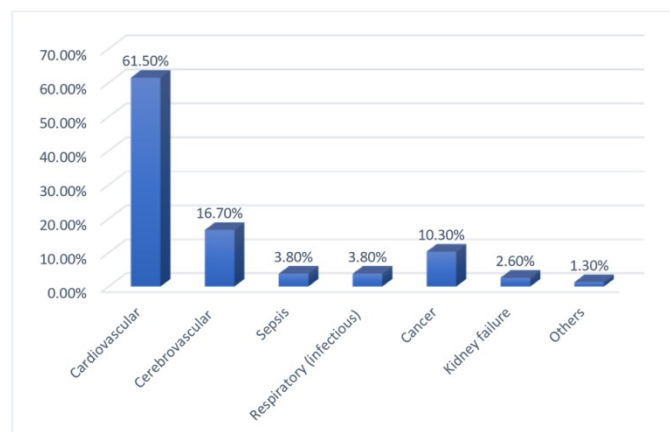


Figure 2. Cause of Death in the Diabetic Population

The bar graph shows the cause of death among the diabetic population with 61.5% of those deaths being Cardiovascular in nature, 16.7% Cerebrovascular, 10.3% linked to cancer, 3.8% sepsis and respiratory (infectious); 2.6% linked to kidney failure and 1.3% classified as others.

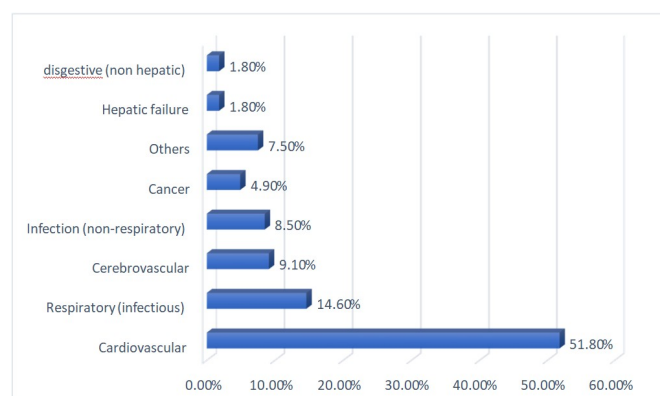


Figure 3. Cause of Death among Elders

The bar graph shows the common cause of death among elders: Cardiovascular (51.8%), Respiratory (infectious) (14.6%), Cerebrovascular (9.1%), Infection (non-respiratory) 8.5%, cancer 4.9%, others 7.5%.

## DISCUSSION

Cardiovascular diseases (CVDs) dominated natural deaths (51.2%), aligning with World Health Organization (WHO) reports identifying CVDs as the global leading cause of mortality (WHO, 2016). However, the proportion among Guyanese diabetics (61.5%) exceeds rates observed in high-income countries, where CVD-related mortality among diabetics typically ranges from 40% to 50% (Einarson *et al.*, 2018). This disparity may reflect systemic gaps in diabetes management and access to care, which are common challenges in low- and middle-income countries (LMICs). The high CVD mortality among elders (51.8%) mirrors global aging-related trends but suggests inadequate secondary prevention strategies. For instance, only 8.5% of elderly deaths were linked to non-respiratory infections, contrasting with LMICs where infections account for approximately 20% of elderly mortality (GBD 2019 Ageing Collaborators, 2022). This discrepancy may indicate underreporting or competing mortality risks from chronic diseases in Guyana. Notably, 16.4% of natural deaths occurred in diabetics, consistent with WHO estimates that diabetes contributes to 1.6 million global deaths annually (WHO, 2016).

However, Guyana's rate is significantly higher than the global age-standardized diabetes mortality rate of 6.7% reported in 2019 (IDF Diabetes Atlas, 2021). This elevated burden may be exacerbated by barriers to glycemic control and fragmented care models in resource-limited settings. Dagogo-Jack (2002) emphasized that most diabetic patients in LMICs are managed by general practitioners rather than endocrinologists, underscoring the need for specialized training and interdisciplinary approaches to diabetes care. Bluml *et al.* (2014) demonstrated that pharmacist-led interdisciplinary teams can improve diabetes outcomes by reducing HbA1c levels by an average of 0.8%. This model is particularly relevant for Guyana, where task-shifting strategies could address workforce shortages and enhance chronic disease management. Additionally, population-wide sodium reduction policies and hypertension screening programs—successfully implemented in Brazil—could serve as templates for reducing CVD prevalence in Guyana (Malta *et al.*, 2018). The findings also highlight the intersectionality of diabetes and cardiovascular health. Einarson *et al.* (2018) reported that individuals with type 2 diabetes are twice as likely to develop cardiovascular complications compared to non-diabetic individuals. In Guyana, this relationship is evident in the disproportionately high cardiovascular mortality among diabetics, necessitating integrated care models that address both conditions simultaneously.

## CONCLUSION

Autopsy data reveal a critical concentration of preventable cardiovascular deaths in Guyana, disproportionately affecting diabetics and elders. Scaling up task-shifted diabetes care and CVD prevention programs, informed by successful LMIC case studies, is imperative. Future research should evaluate cost-effective interventions, such as community health worker-led screenings and telemedicine consultations.

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