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Burden of Type 1 Diabetes Mellitus (TID) in Saint Vincent and the Grenadines from 2014-2018

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AO and IA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors AO and IA managed the analyses of the study. Author OAO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Type 1 Diabetes Mellitus (TID), is a disease that has long been connoted to as insulin-dependent, childhood-onset, young adult-onset or juvenile onset diabetes with essential insulin deficiency that requires daily insulin administration with peak onset during puberty (10-15) years of age.
Aim: This study was aimed at assessing the Burden of TID among diagnosed Autoimmune disease in Saint Vincent and the Grenadines.
Methods: From 2014 to 2018, individuals with Autoimmune, Immunological and Rare disease were identified from the hospital records of Milton Cato Memorial Hospital, which records information on all patient coming in for healthcare services. A structured data extraction tool was employed to extract the data from the hospital record using the open data kit (ODK). Data was analysed using Statistical Package for Social Sciences (SPSS) version 23 and R Studio statistical software for analysis. The Chi-square test was used to test for association. All statistical tests were two-tailed and Level of Confidence was set at 95%, and P values < 0.05 was considered to be statistically significant.

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Results: The mean age of patient with Type 1 Diabetes was 26.58 ± 11.73 yrs. old and the median Age was 31 years. old, almost two-third 81(64.8%) were females. Yearly, women showed a significantly higher incidence of T1D than men, there was an annual decrease in the incidence from 2014 to 2018, with a peak incidence in 2014 (0.49/1000 person-years). There was an annual decrease in the incidence from 2014 to 2018, with a peak incidence in 2017 for male (0.40/1000 person-years) and in 2014 for females (0.69/1000 person-years). The lowest incidence was noted in 2018 (0.00/1000 person-years) and (0.08/1000 person-years) for both male and female respectively. There was increased mortality in people with T1D with a baseline of 3% in 2014 to 33% in 2018.

Conclusions: Sequel to the findings of this study, the incidence of autoimmune disease, Type 1 diabetes Mellitus have decreased in the last decade, whereas the mortality rates have increased. This finding of increased mortality of T1D suggests that this disease is no longer rare and will have implications for future healthcare planning.

Keywords: Type 1 diabetes mellitus; incidence; Saint Vincent and the Grenadines.

1. INTRODUCTION

Type 1 Diabetes Mellitus (TID), is a disease that has long been connoted to as insulin-dependent, childhood-onset, young adult-onset or juvenile onset diabetes with essential insulin deficiency that requires daily insulin administration with peak onset during puberty (10-15) years of age [1]. The pathophysiology of Type 1 diabetes is an insulin-requiring chronic disorder which stems from an autoimmune demolition of the pancreatic *β* cells through cell mediated immunity as well as a humoral immune response, culminating in elevated concentrations of blood sugar and gradual functional excoriation and degeneration of various organs and tissues. Elevated blood glucose concentrations activate oxidative stress with concomitant degeneration of DNA, lipid and protein macromolecules by free radicals with accelerated diabetes-linked non enzymatic glycosylation or glycation of proteins and tissues damage in non-healthy persons, but not so in healthy persons.

The etiology of type 1 diabetes is unknown; T1D often starts suddenly and may include symptoms such as the most important polydipsia, polyuria, polyphagia, lack of energy, excessive fatigue, sudden weight loss, slow healing of wounds, frequent infections and blurred vision and diabetic ketoacidosis following severe dehydration especially in children and adolescents. The symptoms are more severe in children than adults. Economically disadvantaged families, access to self-care tools including self-management education as well as access to insulin is limited. This pitfall leads to severe disability and reducing the Quality-of-life years of the individual. Even though, type 1 diabetes permeates all age groups, numerous epidemiological investigations emphasize disease features with clinical disease in childhood and adolescence, and sometimes present difficulties of differentiation from certain forms of type 2 diabetes or Latent Autoimmune Diabetes in Adults, LADA [2].

Type 1 diabetes is an important and excruciating chronic disease of children globally, with resultant 8- to 10-fold excess risk of death in developed regions, whereas most cases die within a short period in developing countries, or where not adequately followed-up or registered may elude healthcare personnel in developed countries [3]. A 60-fold internal gradient in the incidence of type 1 diabetes and epidemic periods have ostensibly been identified and reported. In 1995, the global prevalence of diabetes mellitus (DM) in adults was estimated to be 4.0% and projected to rise to 5.4% by the year 2025 [4]. However, by 2011, the International Diabetes Federation (IDF) estimated the global prevalence of diabetes mellitus to be 8.3% and projected a rise to 9.9% by 2030. In absolute numbers, this translates to 366 million persons with diabetes mellitus in 2011 which will rise to 552 million people by 2030. Eighty percent of those with diabetes live in low- and middle-income countries [5]. In the Caribbean, the overall prevalence of diabetes mellitus is estimated to be approximately 9% and is responsible for 13.8% of all deaths among adults in the region [5, 6]. Diabetes mellitus is therefore one of the major public health challenges for the Caribbean in the twenty-first century.

Living with type 1 diabetes remains a challenge for the child and the whole family even in countries with access to multiple daily injections

or an insulin pump, glucose monitoring, diabetes education and expert medical care. Poor metabolic control may result in the acute complications of hypoglycemia and ketoacidosis, chronic microvascular and macro vascular complications and death [7- 9]. Children are more sensitive to a lack of insulin than adults and are at higher risk of a rapid and dramatic development of diabetic ketoacidosis. Episodes of severe hypoglycemia or ketoacidosis, especially in young children, are risk factors for structural brain abnormalities and impaired cognitive function, which may cause schooling difficulties and limit future career choices [10, 11]. Many children and adolescents find it difficult to cope emotionally with their condition. Diabetes causes them embarrassment, results in discrimination and limits social relationships. It may impact on school performance and family functioning. Many schools and nurseries are reluctant to receive children with diabetes [12].

Like many developing nations, Caribbean countries are undergoing significant demographic changes. As such, these countries have a double burden of infectious/communicable diseases (e.g., HIV/AIDS) and chronic, non-communicable diseases (especially diabetes), and these diseases are assuming epidemic proportions. Few reviews of diabetes in this population have been conducted; however, this article summarizes the available information on the epidemiology of diabetes, the types of diabetes, the etiologic factors and complications of diabetes, and the public health burden associated with diabetes in the Caribbean.

Due to the paucity of information on the incidence and mortality of diabetes mellitus Type 1 within the population of Saint Vincent and the Grenadines. This study was aimed at assessing the Burden of TID among diagnosed Autoimmune disease in Saint Vincent and the Grenadines. This would provide empirical information in characterizing the incidence and mortality of type 1 diabetes in order to effectively and efficiently collate and evaluate healthcare and economics of diabetes, promote and establish domestic programs in the epidemiology of diabetes to prevent and curb the debilitating disorder and its concomitant complications.

2. METHODOLOGY

2.1 Study Area

This study was carried out in Kingstown, Saint Vincent and the Grenadines. St. Vincent and The Grenadines comprises of 32 islands and cays, of which 9 are inhabited. The largest is St. Vincent, where the nation's capital, Kingstown, is located. St Vincent and the Grenadines has a population of 111,000, which has remained fairly flat since 1990. In 2019, St Vincent and the Grenadines has an estimated population of 110,589. The country is densely populated with 307 people per square kilometer (792/sq. mi). The capital and largest city is Kingstown, with a population estimated at 35,000.

Most Vincentians are the descendants of African slaves brought to the region to work plantations, as well as Portuguese and East Indians, who were brought to the island after slavery was abolished by the British living in the region. The largest ethnic group was African (66%), followed by those of mixed descent (19%), East Indian (6%), Europeans (mostly Portuguese (4%), and Carib Amerindian (2%). There is a growing community of Chinese people in the country. In 2012, the male population (55,551) outnumbered the female (53,637). The population is young, with almost 25 per cent under the age of 15 and 41.7 per cent under the age of 35. Although this under-35 age group has decreased since the 2001 census by 6.1 per cent, it remains the largest proportion of the total population. The 2012 census determined the population aged under 5 years to be 8,645. A little over 9.1 per cent of the population is over the age of 65.5.

St Vincent has both public hospitals and private clinics in the area around Kingstown. Being a small developing nation, the level of care is well below that of the US or Europe and the public facilities are often stretched way beyond capacity.

There are public hospitals and clinics throughout the islands, with each place (with the exception of Mayreau) having some form of medical center. Any serious problems, however, will require a trip to out of St Vincent. Public spending on health in St Vincent and the Grenadines was four per cent of GDP in 2011, equivalent to US$310 per capita. In the most recent survey, conducted between 1997 and 2010, there were 75 doctors, and 379 nurses and midwives per 100,000 people. Additionally, in the period 2007-12 virtually all births (99 per cent) were attended by qualified health staff and in 2012, 94 per cent of one-year-olds were immunized with one dose of measles.

The Milton Cato Memorial Hospital (MCMH) is a 215-bed hospital serving the 110,000 inhabitants of St. Vincent and the Grenadines. The hospital was originally called the Colonial Hospital, built in the early 19th century by the British government under the colonial system, and later renamed Kingstown General Hospital. In the late 1800s, the Imperial Parliament granted permission for construction of a new wing, which was opened in 1889, and contained a total of seven beds. In 1914, the Princess Mary Louise wing was completed, and used mainly as nurses' quarters. As a public hospital, all of Milton Cato Memorial Hospital's services operate under the auspices of the Ministry of Health, Wellness and the Environment. Patients are required to pay user fees for medical services, which don't often recover the services' true costs. That being said, patients who cannot afford to pay are not prevented from accessing healthcare.

2.2 Study Design

The study utilized a retrospective population-based study which consists of secondary data derived from Milton Cato Memorial Hospital of patients with Autoimmune disease.

2.3 Inclusion Criteria

- Data on Immunological disease and rare disease

2.4 Exclusion

- Incomplete data on Immunological disease and rare disease

2.5 Data Collection Procedure

A semi-structured interviewer-administered questionnaire with close and open-ended questions will be used to collect relevant information with the aid of an android mobile device using the open data kit (ODK).

The interview schedule consisted of 15 sections:

A structured data extraction tool was employed to extract the data from the hospital record with the aid of an android mobile device using the open data kit (ODK). The data extraction tool was developed and modified with reference to existing tools used in similar studies. The data extraction tool comprises of information on sociodemographic (age, sex), year of diagnosis and diagnosis.

2.6 Outcome Measures and Data Analysis

For annual incidence, the year-specific numerator included subjects with incident cases of Autoimmune disease in the specific calendar year, and the denominator included the mid-year population from the Population and Demographic Health Survey (DHS) from 2013-2019 which are cross-sectional surveys conducted every year, compiled by the Statistical Office Ministry of Finance, Economic Planning, Sustainable development and Information Technology of the Government of Saint Vincent and the Grenadines Population. This nationally representative survey involved a multi-stage sampling design up to the household level with enumeration areas distributed by region and type of residence using the most recent national census as its sampling frame. Crude rates, sex- and age-specific rates, standardized rates adjusted for sex and age using the 2014-2018 mid-year population, and their 95% confidence intervals (CIs) were calculated.

Incident cases of T1D disease were defined as those with disease in a particular year (e.g., 2014) and the preceding year (e.g., 2013 to 2014) that met the algorithm in that year (e.g., 2015) and the following year (e.g., 2016). Subgroup analyses were performed according to age and sex, the mortality rate in cases of Diabetes Mellitus Type 1 was estimated by dividing the number of incident Diabetes Mellitus Type 1 who died during the study period by the number of person-years for incident of Diabetes Mellitus Type 1. Mortality rates were also stratified by time since diagnosis.

Data was being edited, collated and entered into the 2019 Microsoft Excel Data Sheet, after which it was exported into the International Business Machine (IBM) Statistical Package for Social Sciences (SPSS) version 23.0 and R Studio statistical software for analysis. The analysis involved the calculation of descriptive statistics (such as frequency distributions, percentages and means) and inferential statistics. Continuous variables were expressed as means ± standard deviation while categorical variables were expressed as absolute frequencies. Parametric analysis was used after tests for normality

confirmed that continuous variables were normally distributed. The Chi-square test was used to test for association. All statistical tests were two-tailed and Level of Confidence was set at 95%, and P values < 0.05 was considered to be statistically significant.

Test of normality was done to check for normal distribution of data using the Shapiro-Wilk test and Kolmogorov-Smirnov Test with significance level set at 0.05. Assumptions were set that If the **Sig.** value of both Test (p>0.05), the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution and non-parametric testing will employed such as the median will be used instead of the mean to represent summative statistics due to the median is no affected by outliers or extreme values.

The information provided by the probability value (p-value) does not provide an estimate for the magnitude of the effect of interest and the precision of this magnitude. As a result of this, most of the inferential statistics reported in this report, did not only provide information on the p-value but also on the magnitude of the effect (effect size statistics) in the form of correlation coefficient, regression coefficient and also their confidence intervals (CIs). Confidence intervals (CIs) were interpreted as the value that encompasses the population or 'true' value. This style of reporting both the effect sizes and their CIs gave a clear understanding of the relationships between the variables.

3. RESULTS

3.1 Socio-Demographics Characteristics of Patients with Diabetes Mellitus Type 1

Table 1 shows the socio-demographics distribution of patient with Diabetes Mellitus Type 1 in respect to age, sex. From 2014 to 2018, the total number of cases of Diabetes Mellitus Type 1 in Milton Cato General Hospital was 125, with almost one-third 38(30.4%) occurring in the year 2014. Among the cases of Diabetes Mellitus Type 1 the mean age was 26.58 ± 11.73yrs old and the median age= 31 years old, almost two-third 81(64.8%) were females.

Fig. 2 shows the trend in incidence by year. Every year, women showed a significantly higher incidence of Diabetes Mellitus Type 1 than men, there was an annual decrease in the incidence from 2014 to 2018, with a peak incidence in 2014 (0.49/1000 person-years). The lowest incidence was noted in 2018 (0.04/1000 person-years). Among sex, there was an annual decrease in the incidence from 2014 to 2018, with a peak incidence in 2017 for male (0.40/1000 person-years) and in 2014 for females (0.69/1000 person-years). The lowest incidence was noted in 2018 (0.00/1000 person-years) and (0.08/1000 person-years) for both male and female respectively.

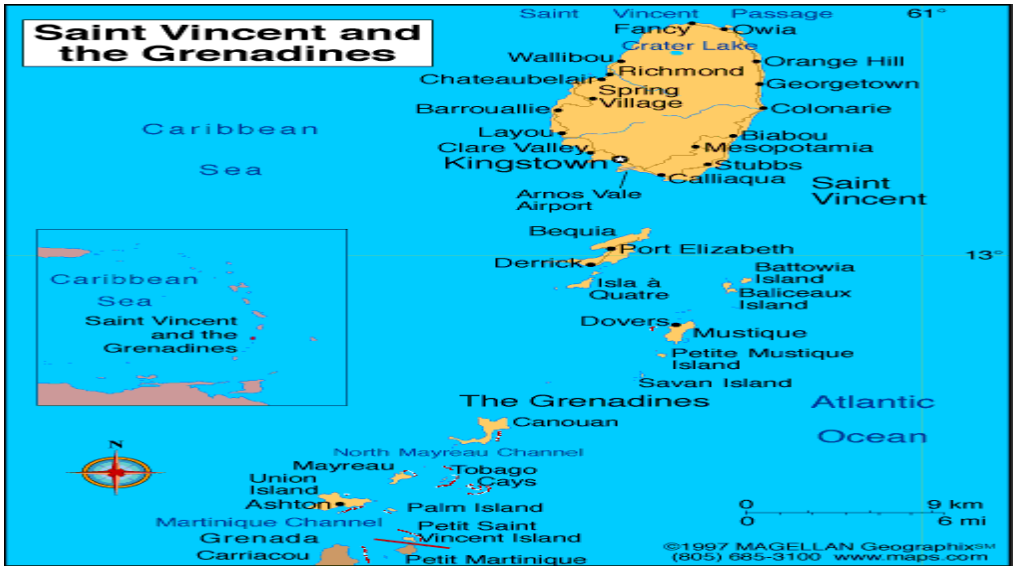


Fig. 1. Saint Vincent and the Grenadines map

Fig. 3 shows that the overall peak age of incidence was 31 to 35 years in 2014. In 2014, the peak age incidence among men was different 36-40 years. However, the peak age of prevalence among women was similar to the overall incidence graph 31 to 35 years of age.

Fig. 4 shows that the overall peak age of incidence was 36 to 40 years in 2015. In 2015, the peak age incidence among men and women similar to the overall incidence graph 36 to 40 years of age.

Fig. 5 shows that the overall peak age of incidence was 36 to 40 years in 2016. In 2016, the peak age incidence among men was different 26-30 years. However, the peak age of prevalence among women was similar to the overall incidence graph 36-40 years of age.

Fig. 6 shows that the overall peak age of incidence was 36 to 40 years in 2017. In 2017, the peak age incidence among men and women was similar to the overall incidence graph 36-40 years of age.

Fig. 7 shows that the overall peak age of incidence was 6-10 years in 2018. In 2018, the peak age incidence among men and women was similar to the overall incidence graph 6-10 years of age.

3.2 Association between Social Demographic Characteristics

In the table 2, among sex, the females had higher proportions across the years (2014-2018) compared to that of the male we hereby fail to reject the null hypothesis which postulates that, there is no significant higher proportion of females to males who have Diabetes Mellitus Type 1 from 2014 -2018 in Saint Vincent and the Grenadines due to there was no statistically significant association observed ($p>0.05$). Among the age group, those within the age group of 31-40 years had significantly higher proportions across the years (2014-2018) compared to that of other age group, this difference was not statistically significant ($p>0.05$). We hereby fail to reject the null hypothesis which postulates that there is no significant higher proportion of individuals ≤ 20 years of age compared to other age groups who have Diabetes Mellitus Type 1 from 2014 -2018 in Saint Vincent and the Grenadines.

In the table 3, those within the age group of 36-40 years had higher proportions of both male and female compared to that of other age group to having diabetics mellitus type 1, however, there was no statistically significant association observed between age and sex *($p>0.05$).*

Table 1. Socio-demographics characteristics of patients with diabetes mellitus type 1

Variable	Frequency (n=125)	Percentage (%)
Age		
≤5	9	7.2
6-10	7	5.6
11-15	12	9.6
16-20	10	8.0
21-25	14	11.2
26-30	9	7.2
31-35	28	22.4
36-40	34	27.2
>40	2	1.6
Mean ± S.D (26.58 ± 11.73) yrs. old, 95% C.I for Mean (24.50-28.65), Median Age= 31 yrs. old		
Sex		
Male	44	35.2
Female	81	64.8
Year		
2014	38	30.4
2015	25	20.0
2016	23	18.4
2017	36	28.8
2018	3	2.4

S.D = Standard deviation, C.I = Confidence Interval

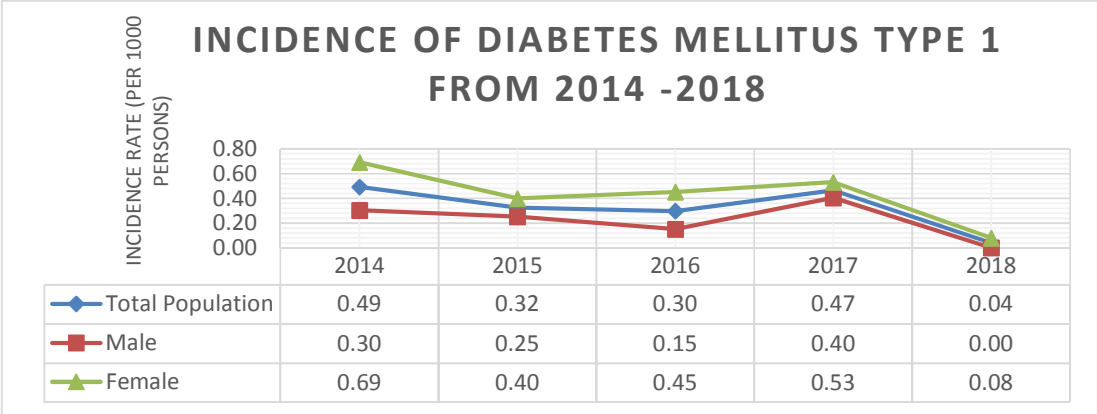


Fig. 2. Incidence of Diabetes Mellitus Type 1 from 2014 -2018

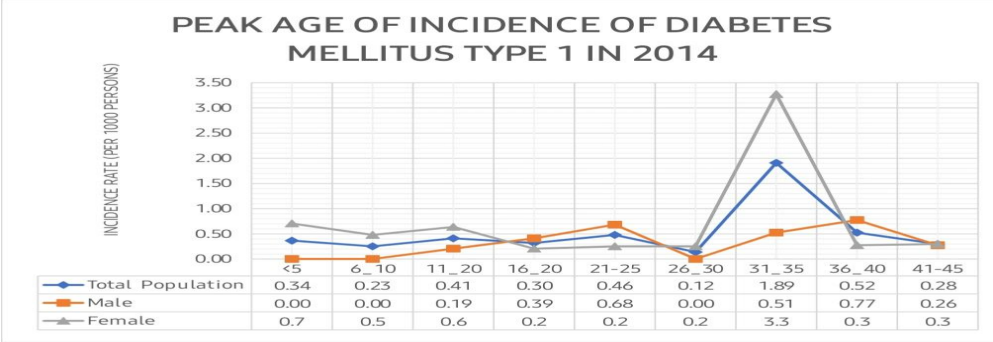


Fig. 3. Peak age of Incidence of Diabetes Mellitus Type 1 in 2014

Fig. 8 shows the case fatality from Diabetics Mellitus Type 1 of the total, 2018 had the highest case fatality of 33% compared to the other years with 2016 having no case fatality at all.

4. DISCUSSION

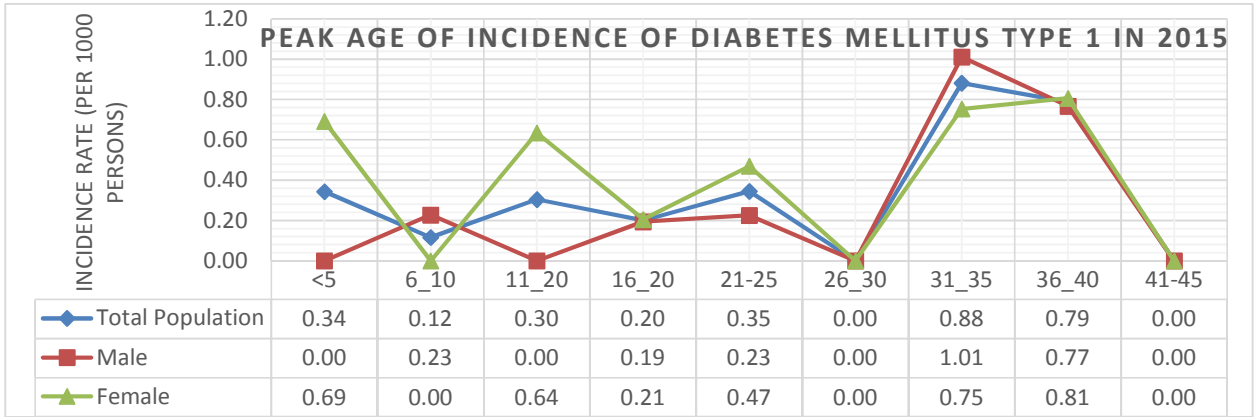
In this study we observed a decreasing trend in the incidence of Type 1 Diabetes Mellitus (T1D) with a baseline of 0.49 per1000 person-years 2014 to 0.04 per 1000 person-years in 2018. The decrease in trend reported in the present study might be explained due to the use of the hospital database could stem from the lack of accurate diagnosis. Another explanation of the findings is that data analyzed in this study were obtained when subjects visited healthcare institutions. Therefore, no information was available for T1D patients who did not visit a healthcare institution, which could underestimate the T1D burden.

The incidence rate of T1D reported was lower compared to findings from a similar study who found an age-adjusted type 1 diabetes incidence difference from 0.1/100,000 per year in China and Venezuela to 36.8/100,000 per year in Sardinia and 36.5/100,000 in Finland. Findings from the study also showed that lowest incidence (<1/100, 000 per year) was realized from China and South America populations. Similar study carried out by the DIAMOND Project Group (2006), also showed that with age-adjusted incidence of type 1 diabetes varied from 0.1 per 100,000/year in China and Venezuela to 40.9 per 100,000/year in Finland [13].

This difference between the incidence rate of both studies can be overestimated or underestimated due to various population size of both countries and the difference in multiplier rate (1000 vs 100000) by both studies which impairs the basis of comparison. The population size in the Caribbean was approximately 120,000 people as at the time of the study.

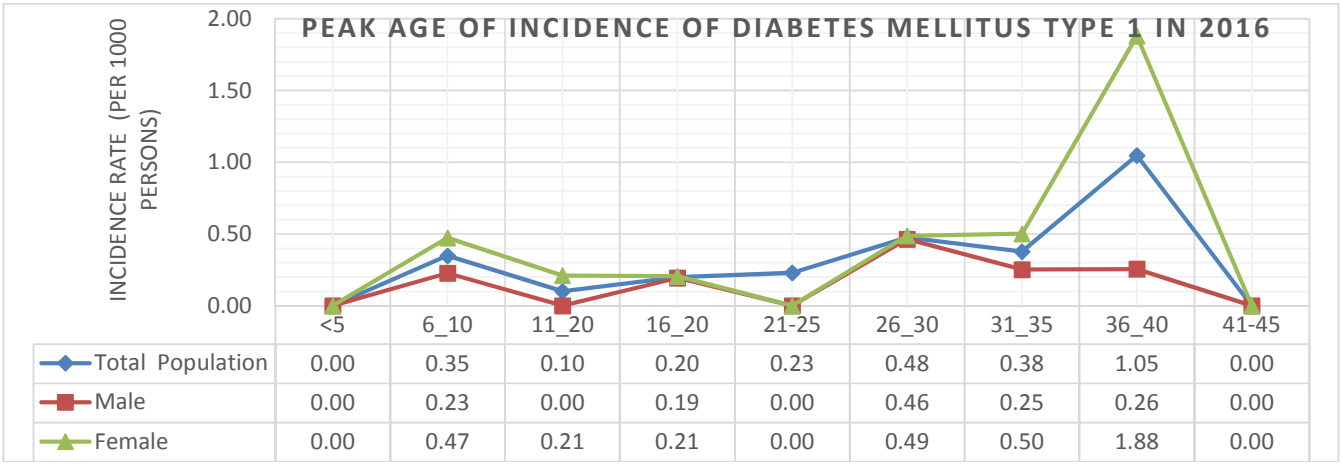
4.1 Social Demographic Characteristics of Individuals Who Have T1D

The incidence of T1D increased continuously with age until it reached a peak, after which, it



	<5	6_10	11_20	16_20	21-25	26_30	31_35	36_40	41-45
Total Population	0.34	0.12	0.30	0.20	0.35	0.00	0.88	0.79	0.00
Male	0.00	0.23	0.00	0.19	0.23	0.00	1.01	0.77	0.00
Female	0.69	0.00	0.64	0.21	0.47	0.00	0.75	0.81	0.00

Fig. 4. Peak age of incidence of diabetes mellitus type 1 in 2015



	<5	6_10	11_20	16_20	21-25	26_30	31_35	36_40	41-45
Total Population	0.00	0.35	0.10	0.20	0.23	0.48	0.38	1.05	0.00
Male	0.00	0.23	0.00	0.19	0.00	0.46	0.25	0.26	0.00
Female	0.00	0.47	0.21	0.21	0.00	0.49	0.50	1.88	0.00

Fig. 5. Peak age of incidence of diabetes mellitus type 1 in 2016

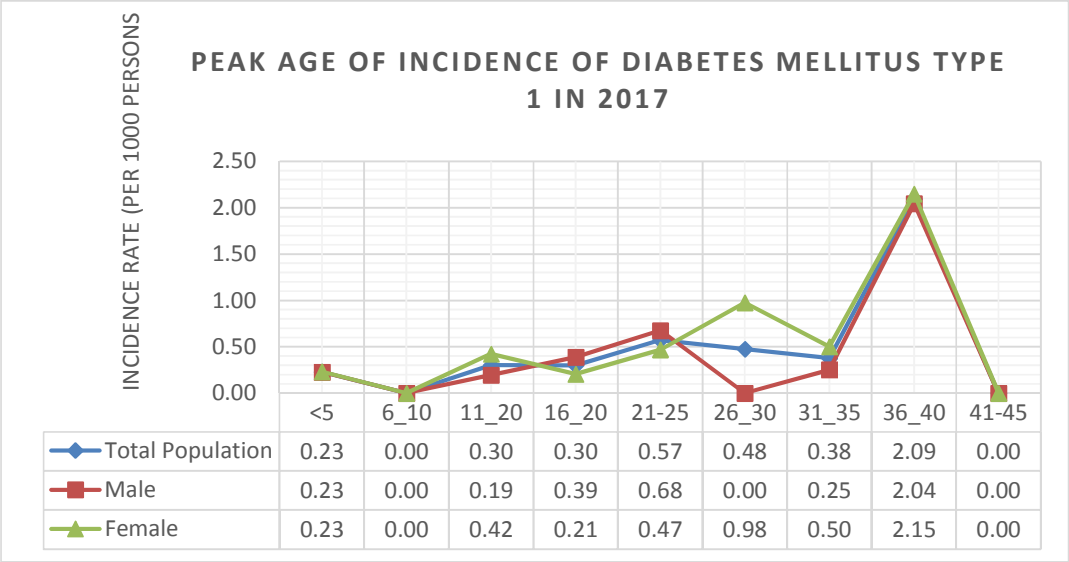


Fig. 6. Peak age of incidence of diabetes mellitus type 1 in 2017

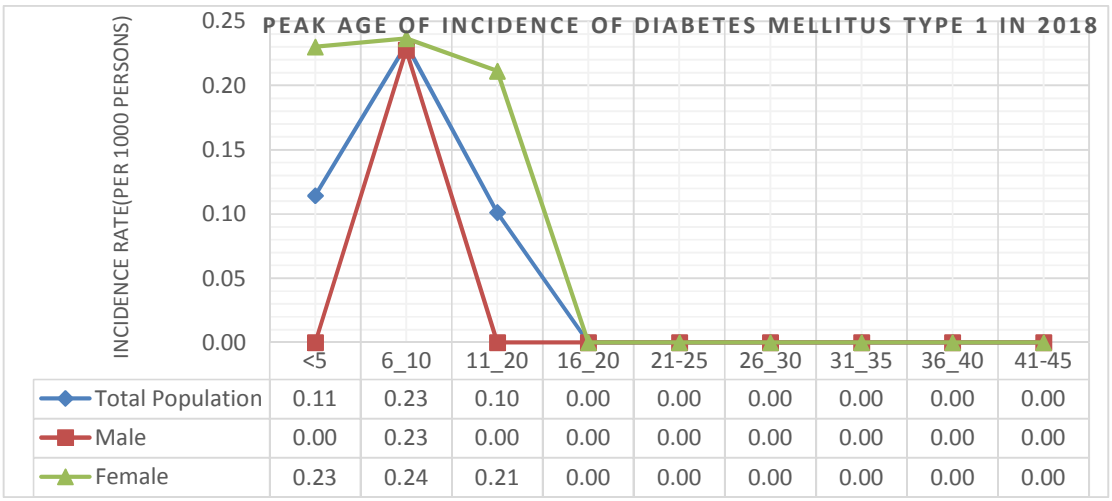


Fig. 7. Peak age of incidence of diabetes mellitus type 1 in 2018

declined slowly. The incidence of T1D among female in this study peaks occurring at 31 to 35years. This pattern might be related to a type of diabetes termed late onset Type 1 Diabetes Mellitus which dissimilar with other studies which showed that T1D is the major type of diabetes in youth, accounting for ≥85% of all diabetes cases in youth < 20 years of age worldwide [14, 15].

In general, the incidence rate increases from birth and peaks between the ages of 10–14 years during puberty [16] which is in contrast with this study. The increasing incidence of T1D throughout the world is especially marked in young children. Registries in Europe suggest that recent incident rates of T1D were highest in the youngest age-group (0– 4 years) [16].

Incidence rates decline after puberty and appear to stabilize in young adulthood (15–29 years). However, in a similar study which reported that the incidence of T1D in adults is lower than in children, although approximately one fourth of persons with T1D are diagnosed as adults. Clinical presentation occurs at all ages and as late as the 9th decade of life. Up to 10% of adults initially thought to have type 2 diabetes are found to have antibodies associated with T1D and beta cell destruction in adults appears to occur at a much slower rate than in young T1D cases, often

Table 2. Trend analysis by age group and sex

Variable							df	χ2 (p-value)	95% Confidence interval (p-value)	
Sex	**2014**	**2015**	**2016**	**2017**	**2018**					
	Freq (%)	**Freq (%)**	**Freq (%)**	**Freq (%)**	**Freq (%)**	**Total (%)**			**Lower limit**	**Upper limit**
Male	12(31.6)	10(22.7)	6(26.1)	16(44.4)	0(0.)	44(35.2)				
Female	26(68.4)	15(60.0)	17(73.9)	20(55.6)	3(100.0)	81(64.8)	4	3.783 (0.392) [F]	0.308	0.476
Total	38(100)	25(100)	23(100)	36(100)	3(2.4)	125(100)				
Age										
≤5	3(7.9)	3(12.0)	0(0.0)	2(5.6)	1(33.3)	9(7.2)	32	0.088 (0.708) [F]	0.308	0.476
6-10	2(5.3)	1(4.0)	3(13.0)	0(0.0)	1(33.3)	7(5.6)				
11-15	4(10.5)	3(12.0)	1(4.3)	3(8.3)	1(33.3)	12(9.6)				
16-20	3(7.9)	2(8.0)	2(8.7)	3(8.3)	0(0.0)	10(8.0)				
21-25	4(10.5)	3(12.0)	2(8.7)	5(13.9)	0(0.0)	14(11.2)				
26-30	1(2.6)	0(0.0)	4(17.4)	4(11.1)	0(0.0)	9(7.2)				
31-35	15(39.5)	7(28.0)	3(13.0)	3(8.3)	0(0.0)	28(22.4)				
36-40	4(11.8)	6(24.0)	8(34.8)	16(44.4)	0(0.0)	24(27.2)				
>40	2(5.3)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	2(1.6)				
Total	38(100)	25(100)	23(100)	36(100)	3(2.4)	125(100)				

**Statistically significant (p<0.05). F (Fisher's Exact test) CI = Confidence Interval) χ2= chi-square test statistics, df= degree of freedom*

Table 3. Association between social demographic characteristics

Variable	Sex			df	χ2 (p-value)	95% Confidence interval (p-value)	
Sex	**Male**	**Female**					
	Freq (%)	**Freq (%)**	**Total (%)**			**Lower limit**	**Upper limit**
Age							
≤5	1(2.3)	8(9.9)	9(7.2)	8	10.632 (0.231) F*	0.158	0.303
6-10	2(4.5)	5(6.2)	7(5.6)				
11-15	2(4.5)	10(12.3)	12(9.6)				
16-20	6(13.6)	4(4.9)	10(8.0)				
21-25	7(15.9)	7(8.6)	14(11.2)				
26-30	2(4.5)	7(8.6)	9(7.2)				
31-35	8(18.2)	20(24.7)	28(22.4)				
36-40	15(34.1)	19(23.5)	34(27.2)				
>40	1(2.3)	1(1.2)	9(1.6)				
Total	44(100)	81(100)	125(100)				

**Statistically significant (p<0.05). F (Fisher's Exact test) CI = Confidence Interval) χ2= chi-square test statistics, df= degree of freedom*

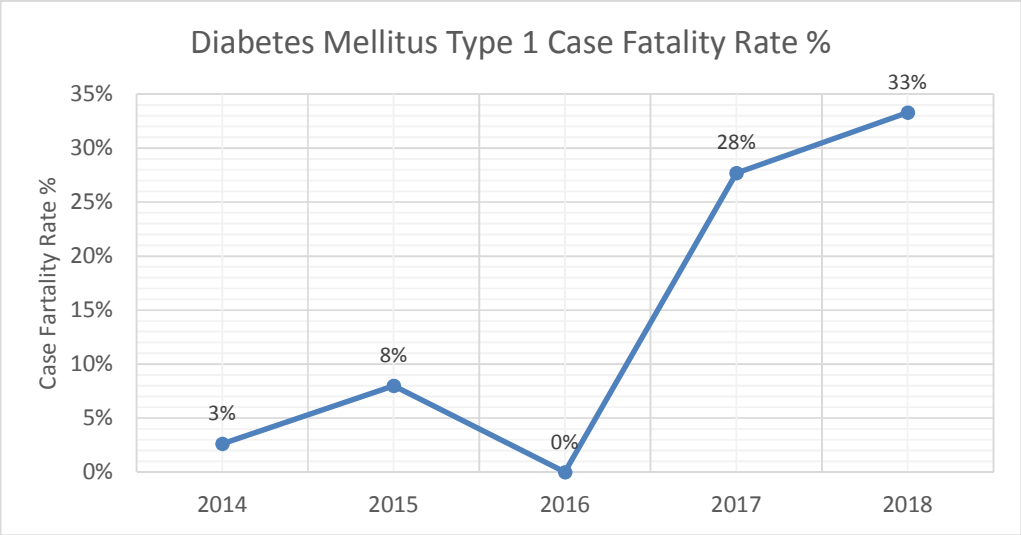


Fig. 8. Case Fatality from Type 1 Diabetes Mellitus

delaying the need for insulin therapy after diagnosis. Individuals diagnosed with autoimmune diabetes when they are adults have been referred to as having latent autoimmune diabetes of adults [17-19].

Also, findings from the study confirmed female predominance in the incidence rate of T1D, with ap-proximately 2-fold higher incidence in women than in men. This finding is similar to some studies who highlighted a distinctive pattern with an observation that regions with a high incidence of T1D (populations of European origin) have a male excess, whereas regions with a low incidence (populations of non- European origin) report a female excess [20, 13, 21, 22] which is resonate with this study with a baseline of 0.49 per1000 person-years 2014 to 0.04 per 1000 person-years in 2018.

4.2 Case-Mortality and Morbidity from T1D

The study findings found increased mortality in people with T1D compared with the general population with a baseline of 3% in 2014 to 33% in 2018. This which that one-third of person that have T1D dies from it. This finding has serious

implication on the healthcare of the country, this finding reveals the gap in the management and treatment of TID. This rate was higher than that found by a Norwegian cohort of 1,906 T1D patients diagnosed at <15 years of age between 1973–1982 (46,147 person-years) reported an SMR for all-cause mortality of 4.0 with an SMR of 20 for ischemic heart disease. Acute metabolic complications of T1D were the most common cause of death <30 years of age [23].

However, this difference could be attributed to both rates were unadjusted. The SMR is more informative than the crude mortality rate because this compares mortality rates to people without SLE of the same age and gender and therefore assesses the excess mortality due to SLE. Alternatively, it may be due to our cases having milder disease or to the different study methods used. However, our study didn't compute age specific mortality rate and sex-specific mortality rate due lack of availability of data and poor management health information system in the country as at the time of the study.

5. CONCLUSION

Sequel to the findings of this study, this study showed that the incidence of autoimmune disease, Type 1 diabetes Mellitus have decreased in the last decade, whereas the mortality rates of Type 1 Diabetes Mellitus have increased. This finding of increased mortality of T1D suggests that this disease is no longer rare and will have implications for future healthcare planning.

6. RECOMMENDATIONS

The study highlights the increase in the mortality due to TID in Saint Vincent and the Grenadines. Primary prevention of diabetes by lifestyle modification, screening for individuals at high risk and prevention of disease complications in established disease through non-pharmacological and therapeutic interventions are all needed to reduce the high burden of diabetes and associated mortality in Saint Vincent and the Grenadines and similar population.

Type 1 diabetes treatment is a challenging issue in developing regions, but not so in developed countries where those living with the disease have easier access insulin, glucometer strips and other materials from government subvention or personal savings. Non-industrialized countries are faced with inadequate resources, limitation in diagnosis, insulin initiation and storage, family, marital and emotional issues and challenges. Since type 1 diabetes affects a few people compared to the general population, it is palpably ignored by governments and policy maker. The socio-economic status in developing regions does not provide the latitude for the required insulin therapy and inextricably-linked monitoring of blood glucose. It is pertinent to spread awareness regarding the metabolic disorder and its sequelae and to undergird government health and healthcare ambient regarding the consequences, pros and cons, in the administration of medicinal drugs for the treatment of diabetes.

From key findings from study, it reinforces the need for improved access to insulin and blood glucose meters and test strips in lower income countries and the training of healthcare workers in such countries to recognize and treat this condition. Three tiers of care (minimal, intermediate and comprehensive) have been defined by availability of insulin and blood glucose monitoring regimens, requirements for HbA1c testing, complications screening, diabetes education, and multidisciplinary care, and it is to be hoped that policy-makers will aspire to attain the highest levels of care possible given the resources available. Provide increased training opportunities for health care professionals by establishing collaborative training programs between professional and non-profit health organizations and clinical programs for research in T1D.

Thus, it is imperative to focus on expansive clinical trials which compare the appropriateness of diverse diabetes medications to provide the guidelines for healthcare providers on which patients to prescribe certain drugs. There tends to be decrease in diabetes complications in certain parts of the world, and the survival and quality of life have improved tremendously, but financial constraints and awareness have restricted ample access to type 1 diabetes prevention, control and treatment, as well as meeting the informed inventiveness and creativity of gadgets, such as the closed-loop systems. The essential management and access to medicinal drugs are more imperative than high-tech systems in developing countries or elsewhere. There is extant optimism with opportunities for the future in unravelling the metabolic and cellular processes in convergence

for researchers, clinicians, healthcare providers and policy makers to undertake intensive measures regarding the issues, challenges and presenting opportunities underlying type 1 diabetes and its sequelae which are solvable.

CONSENT

It is not applicable

ETHICAL APPROVAL

Approval was gotten to access medical information of patients from Ministry of Health and Wellness and Hospital Administrator at Milton Cato Memorial Hospital in Saint Vincent and the Grenadines.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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