

Temporal Trends of Glycated Haemoglobin Control in Hong Kong Before and During Coronavirus Disease 2019: Interrupted Time-series Analysis (2018-2023)

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Introduction

- **Glycated haemoglobin** (HbA1c) is a common parameter for diagnosis, monitoring diabetic control and predicting diabetes-related complications^{1,2}
- **Coronavirus Disease 2019** (COVID-19) has significantly disrupted provision of healthcare services globally due to the implementation of restrictive anti-pandemic measures
- Overseas population-wide cohort studies reported **inconsistent results** on the impacts of COVID-19 on HbA1c control³⁻⁵
- A **territory-wide interrupted time-series** (ITS) analysis could provide a comprehensive evaluation on the trend of HbA1c control before and during the pandemic by analysing **average population HbA1c** and **total number of HbA1c tests** from 2018 to 2023 in Hong Kong (HK)

Aims and Objectives

- To compare the change in the trends of HbA1c value and total number of HbA1c testing before and during the COVID-19 pandemic
- To evaluate the impacts of COVID-19 on HbA1c control of the general population in HK

Materials and Methods

Study design and study population:

- This study was a **retrospective ITS analysis** by retrieving anonymized data from Clinical Data Analysis and Reporting System (CDARS)
- Date of HbA1c test performed and HbA1c value were collected monthly from 2018 to 2023
- The **study population** was restricted to participants ≥ 18 -year-old with at least one HbA1c record during 2018 to 2023

Outcome:

- Change in mean HbA1c level and number of tests before and during the COVID-19 pandemic

Statistical analysis:

- Microsoft Excel was used to generate the **monthly mean of HbA1c value and total number of HbA1c tests**
- Data Analysis was conducted with **Statistical Package for Social Sciences** (SPSS) version 29.0.2
- **Autoregressive Integrated Moving Average** (ARIMA) model is often used to detect the trend of infectious disease outbreaks⁶. Thus, this model was selected to evaluate the impacts of COVID-19 on HbA1c control

Ethics Approval:

- The study was approved by the Institutional Review Board of the University of Hong Kong and Hospital Authority Hong Kong West Cluster (Reference number: UW 23-579)

Limitations and Future Directions

- Patients may forego follow-ups or go private clinics due to concerns of virus transmission in public hospitals. Thus, there was **loss to follow-up**¹¹
- The increase in testing number for HbA1c could potentially be contributed by the **increasing number of patients diagnosed with diabetes**, which was not ascertained from the current study
- **Multiple factors** such as diet, level of physical exercise and medication adherence could affect HbA1c control, however, this data could not be extracted from CDARS
- The current study examined the broad impacts of COVID-19 on a population level. Future study can explore **individual-level factors**, including patient characteristics and confounders like diet and exercise

Conclusion

- Generally, the change in HbA1c control during the pandemic in HK was statistically insignificant, suggesting that **COVID-19 alone was not a contributing factor**
- The observable unexpected decrease in HbA1c value during the pandemic could be due to **higher awareness of health** among the HK population, while the change in testing number was possibly caused by **different severity in strain of the healthcare system** in HK
- It is recommended to study **non-pharmacological aspects** to further evaluate their impacts on HbA1c control

Results

Figure 1: Average HbA1c value of the HK population from 2018 to 2023

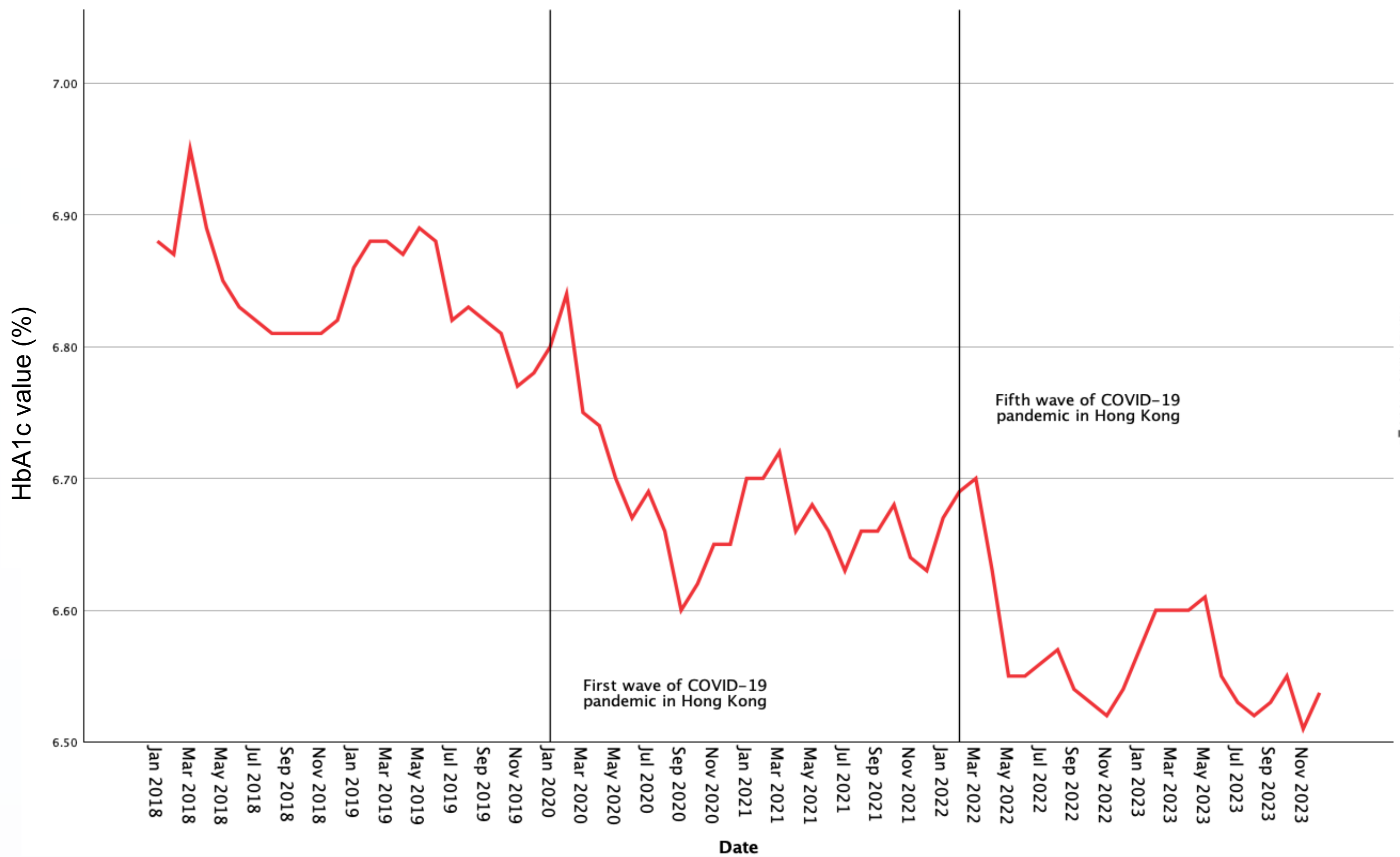


Figure 2: Number of HbA1c tests of the HK population from 2018 to 2023

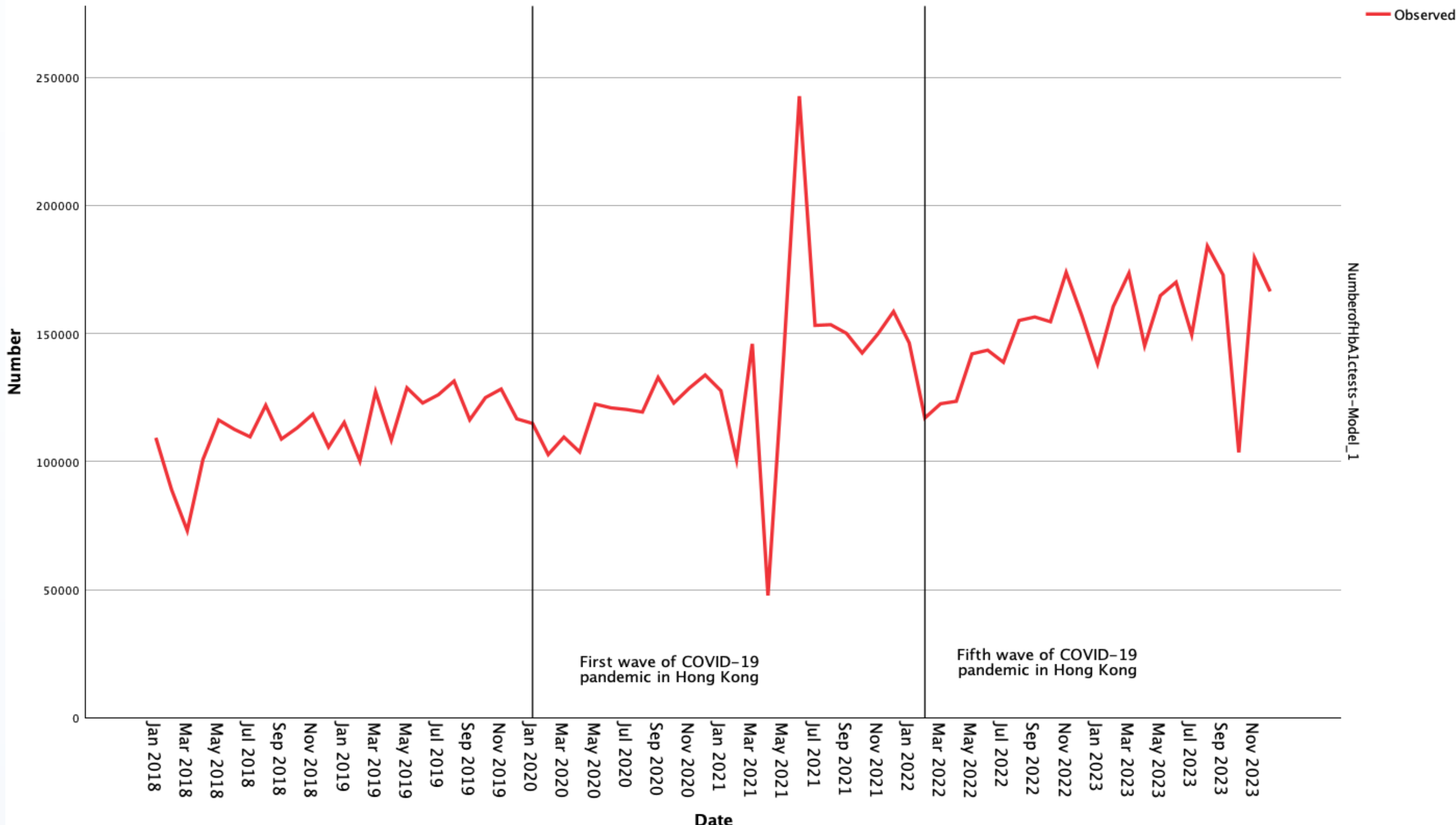


Table 1: Change in overall HbA1c value and total number of HbA1c tests

<i>HbA1c value</i>	Level Change	Slope Change		
	Estimate (95% CI)	p-value	Estimate (95% CI)	p-value
First wave of the COVID-19 pandemic	0.027 (-0.038 – 0.092)	0.414	-0.003 (-0.199 – 0.017)	0.753
Fifth wave of the COVID-19 pandemic	0.047 (-0.018 – 0.112)	0.160	0.002 (-0.018 – 0.022)	0.866
<i>Number of HbA1c test</i>				
First wave of the COVID-19 pandemic	-20,250 (-39,985 – -515)	0.049	846 (-896 – 2588)	0.345
Fifth wave of the COVID-19 pandemic	-18,252 (-37,987 – 1482)	0.075	-729 (-2471 – 1013)	0.415

Discussion

- Generally, **HbA1c value** showed a **decreasing** trend while **number of HbA1c tests increased** from 2018 to 2023 (as shown in Figure 1 and 2)
- It was unexpected to observe **no change in HbA1c values** after the pandemic in HK as statistical significance was not achieved. This discrepancy in findings, as compared to overseas studies showing a statistically significant increase, could be due to **different anti-pandemic policies and lifestyle choices**⁷⁻⁹
- Statistical significance for **reduction in HbA1c number of tests after the first wave** was reached, but not for after fifth wave, such results were comparable to previous literature^{3,5,10}
- This phenomenon could possibly be due to **unprecedented experience** with a pandemic, leading to a **more pronounced disruption** after the first wave
- An ITS analysis demonstrating statistically insignificant results on the change in HbA1c value and number of HbA1c tests after the fifth wave during the pandemic potentially indicated the presence of **additional contributing factors**

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