Research Article

THJPH

Factors associated with Influenza Vaccination Uptake among Nursing Staff in Brunei Darussalam

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Abstract

Background Vaccine hesitancy in healthcare workers remains a complex issue, with influenza vaccination coverage varying between healthcare institutions, across cities and countries, and amongst different healthcare professions. This study aimed to assess influenza vaccination uptake among nursing staff in Brunei Darussalam and explore factors affecting decision making on influenza vaccination.

Methods This cross-sectional study on registered nursing staff used a web-based self-administered validated questionnaire to collect data on socio-demographics, history of influenza vaccination, reasons for and against influenza vaccination, knowledge and information access, as well as cultural and institutional values.

Findings The study received a response rate of 36%, with respondents being predominantly female (84.2%), working in the government sector (90.1%), and in hospital settings (78.5%). Majority of nurses (96.5%) perceived that influenza vaccination was effective in reducing transmission of influenza virus, although actual annual uptake was 33.5%. Main facilitators for receiving vaccination were upon the advice or directive of authorities and employer (>75%), and severity of influenza-related complications (62.5%).

Conclusions Despite having adequate knowledge of efficacy of influenza vaccination, there is sub-optimal uptake of influenza vaccination among nursing staff in Brunei Darussalam (33.5%). However, this uptake increased during the COVID-19 pandemic (67.3%). Periodic awareness,

counseling and strategic occupational health interventions are some measures that can increase the coverage of influenza vaccination among healthcare workers.

Keywords: Influenza, Vaccination uptake, Vaccine hesitancy, Healthcare worker, Nurses

What was Known

- There is a wide range of variation for influenza vaccination coverage rates among countries as well as amongst health professional groups.
- Despite influenza vaccine being highly effective in minimizing severe acute respiratory infections from the influenza virus, vaccine hesitancy is notably present among healthcare workers.

What's New and Next

- Further longitudinal research is required to observe trends for vaccination uptake and hesitancy, and other factors that play a role in influencing a healthcare worker's intent to get vaccinated, particularly as the world is facing constant and challenging public health threats from new and emerging diseases.
- Future research should focus on the development of an influenza vaccine that can remain efficacious for more than one year, to improve influenza vaccination uptake rates globally.

Introduction

Since the first global outbreak of the Spanish Flu in 1918, also known as the Great Influenza epidemic, influenza vaccination has been widely accepted as an effective occupational and public health measure. As influenza vaccine is known to be safe and effective, the World Health Organization (WHO) recommends that annual influenza vaccination be administered particularly to high risk groups such as pregnant women, young children, elderly, individuals with chronic medical conditions, and healthcare workers (HCWs)[1]. Despite WHO recommendations and numerous substantial data, influenza vaccination coverage rates amongst HCWs continue to vary from <5% to >90% between healthcare institutions, across cities and countries, and even amongst different healthcare professions[2]. In a recent study among HCWS from 18 government and 44 private health facilities in South Africa, 62.7% had ever received influenza vaccination; however, the annual vaccination uptake was only 24.3% in 2017 and 33.3% in 2018. A study from Ireland showed improved influenza vaccination uptake among HCWs over nine influenza seasons ranging 18.1% (2011-2012) to 58.9% (2019-2020) with strategic planning and actions

by health authorities[3,4]. Vaccine hesitancy in HCWs, in general, remains a complex issue requiring ongoing education and awareness activities[5]. WHO defines vaccine hesitancy as a delay in acceptance or refusal of vaccines despite availability of vaccination services. Vaccine hesitancy is complex and context-specific varying across time, place and type of vaccine. It includes factors such as complacency, convenience, confidence, and trust[5]. While vaccine hesitancy in childhood vaccination remains the focus of most research, adult and adolescent vaccination research have gained traction in recent years, particularly during seasonal and pandemic public health events[6]. Recognizing its impact on global health, the Strategic Advisory Group of Experts (SAGE) on Immunization was established in March 2012[7]. This working group enlisted three key areas in determining vaccine hesitancy: (i) contextual influences – including historic, socio-cultural, environmental, health system/institutional, economic or political factors; (ii) individual and group influences – including influences arising from personal perception of the vaccine or influences of social/peer environment; and (iii) vaccine and vaccination-specific issues which are directly related to the characteristics of the vaccine or the vaccination process. A SAGE report produced in November 2014 emphasized the important role of HCWs in combating vaccine hesitancy including targeting large specific populations as an intervention with the largest positive effect vaccine uptake. In its report, SAGE also recommended for WHO member states to address the vaccine hesitant behavior of the HCW population[8].

A survey conducted by WHO Western Pacific Region (WPRO) in 2012 which looked at seasonal influenza vaccination policies, recommendations and existing practices involving 37 countries found that most countries' HCW population were amongst the recommended groups to receive influenza vaccination[9]. Other regional countries showed that the level of influenza vaccination coverage among HCWs during periods of heightened awareness of influenza pandemics between 2005 and 2010 were 56.8%, 50% and 56.8%[10-12]. A similar finding was also observed in an Italian study during the COVID-19 pandemic whereby a significant increase in influenza vaccination coverage among HCWs was observed in 2020/21, particularly in the sub-groups characterized by lower uptake rates in the previous years; thus showing the positive influence of a co-circulating virus[13]. A latter study carried out in Hong Kong showed that the level of coverage dwindled to 24% during lower WHO alertness levels[14].

Citizens of Brunei Darussalam, which has a total population of 459,000, benefit from healthcare services that are heavily subsidized by the government. Healthcare services are

mainly provided by government healthcare facilities. The national immunization programme, which includes childhood and adult immunizations, is delivered through vaccination clinics located in health centres. As reported by WHO, Brunei Darussalam has had a consistently high childhood vaccination coverage of 99% for all vaccine preventable diseases in the last few years[15]. However, there is currently lack of data on influenza vaccination uptake among HCWs in in the country. As nurses play an integral role in healthcare and constitute more than half of the HCW population in Brunei Darussalam, this study aimed to assess influenza vaccination uptake among nursing staff and explore factors affecting decision making on influenza vaccination.

Materials and Methods

Study design, and Population and sample size

The study conceptual framework was developed as a result of a research interest to determine the percentage uptake of influenza vaccination amongst nursing staff in the country, and factors that affect decision-making to receive influenza vaccination.

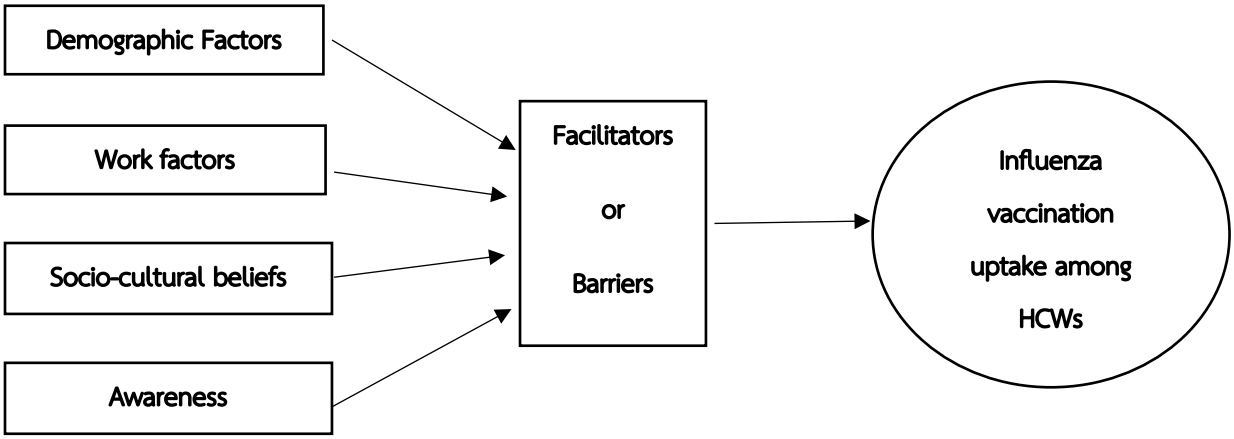

Figure 1. Conceptual framework of the study

Using 95% confidence interval, 5% margin of error, an average of 50% prevalence for influenza vaccination uptake among HCWs as reported in other similar studies, and a HCW population of 4500 in the country, the calculated sample size was 355[2,16]. This study used convenience sampling whereby all registered nurses with the national authority professional board were invited to participate. This cross-sectional study, which was conducted from May

until June 2017, used a web-based self-administered validated questionnaire which collected data on socio-demographics, history of influenza vaccination, reasons for and against influenza vaccination, knowledge and information access, as well as cultural and institutional values. The questionnaire was originally designed and used by the Chinese University of Hong Kong in a previous study[17], and prior permission was obtained from the original researchers. Some of its contents were modified to suit the local context, and pilot-tested on a small group of healthcare workers to ensure comprehensibility. The questionnaire was in both local Malay and English languages, with both versions being independently reviewed and approved for use by linguistics experts from the Language and Literature Bureau. The questionnaire was distributed to nurses in the government and private sectors in the country who were registered with the national authority professional board, NBB, via Nurse In-Charges of departments/divisions/units/facility. The questionnaire mainly required a yes/no or agree/disagree response and a Likert scale response. The questionnaire showed good internal consistency and reliability with Cronbach's alpha of 0.93, 0.69 and 0.91 for the questions regarding perceived vaccine effectiveness, barriers and facilitators respectively.

Data collection and data analysis

Data was transcribed verbatim from the online questionnaire for qualitative and quantitative data analysis. Descriptive analysis was performed using frequency and percentage for information that identified demographics, professional educational background, and past and present influenza vaccination history. Descriptive analysis was also performed for the section that required a Likert scale response, and this included identifying factors for vaccination hesitancy, influences in decision making for present and future vaccine acceptance, and perception and beliefs on efficacy of influenza vaccination. Pearson's Chi-Square test was used to compare influenza vaccination uptake with demographics and work factors. A *p*-value of <0.05 was considered as statistically significant.

Results

Demographic characteristics

During the time of the survey, there were a total of 3003 nurses registered with NBB[16]. The study received 1233 responses; however, 151 were discarded due to incomplete information, thereby giving a final response rate of 36% (1082). Participants were predominantly female (84.2%) and from the government sector (90.1%). A large percentage (78.5%) was from

hospital settings while 19.4% were from primary health centers and clinics. Majority of the nurses were aged 30–39 years (45.6%), followed by 40–49 age group (22.7%). 61.8% of nurses had more than ten years of work experience.

Table 1. Demographic and work characteristics of nurses.

Demographics	Number (N=1082)	Percentage (95% CI)
Age group (years)		
20–29	186	17.2 (15.1–19.6)
30–39	493	45.6 (42.6–48.5)
40–49	246	22.7 (20.3–25.3)
≥50	157	14.5 (12.5–16.7)
Gender		
Male	171	15.8 (13.8–18.1)
Female	911	84.2 (81.9–86.3)
Professional qualification		
Certificate in Nursing	212	19.6 (17.3–22.1)
Advanced/Diploma in Nursing	698	64.5 (61.6–67.3)
Undergraduate	137	12.7 (10.8–14.8)
Postgraduate or higher	24	2.2 (1.5–3.3)
Other[#]	11	0.9 (0.5–1.8)
Job position		
Nursing officer or higher	56	5.2 (4.0–6.7)
Senior/Staff nurse	838	77.5 (74.9–79.8)
Assistant nurse	178	16.5 (14.4–18.8)
Other[##]	10	0.9 (0.5–1.6)
Workplace		
Hospital	849	78.5 (75.9–80.8)
Health center/clinic	210	19.4 (17.2–21.9)
Other[###]	23	2.1 (1.4–3.2)

Work experience (years)		
≤5	160	14.8 (12.8-17.0)
6-10	253	23.4 (21.0-26.0)
>10	669	61.8 (58.9-64.7)
Work sector	975	90.1 (88.2-91.6)
Government	107	9.9 (8.2-11.8)
Private		

[#]includes Basic nursing course or GCE O level.

[##]includes Nursing Lecturer, Nursing Senior Assistant Professors.

[###]includes non-hospital or non-health center/clinic settings e.g. Health Promotion Centre, School health, and Higher educational institutions.

Vaccination uptake

Only 33.5% of nurses reported that they had received an influenza vaccination in the past one year (Table 2). The influenza vaccine is a fairly safe vaccine with low risk of serious side effects, and this was reflected in 31.4% of nurses who had experienced mild side effects following the vaccination, of which the commonly reported ones were pain and/or swelling at injection site (58.8%), followed by fever (49.4%) and localized muscle pain (29.7%). There were no reports of severe side effects. Majority of nurses (96.5%) perceived that influenza vaccination was effective in reducing transmission of influenza virus to themselves, family, colleagues, patients and for the prevention of an outbreak of influenza epidemic. Due to this, a high proportion (83.4%) expressed willingness to receive their subsequent influenza vaccination. However, in contrast to this finding, Table 3 shows that a high proportion (66.6%) of the same participants had not received their influenza vaccination in the past one year. On comparison between the vaccinated and unvaccinated groups, uptake was significantly higher in the older age group (>50 years; p <0.01), nurses who held a senior job position (p =0.01), nurses who were working in a primary care facility (p =0.03), and those working in the government sector (p <0.01).

Table 2. Nurses' uptake of influenza vaccination, reported side effects, perceived vaccine effectiveness and willingness for future vaccination.

Variable	Number (N=1082)	Percentage (95% CI)
Received influenza vaccination in the last one year		
Yes	363	33.5 (30.8–36.4)
No	719	66.5 (63.6–69.3)
Post-vaccination side effects		
Yes	340	31.4 (28.7–34.3)
No	742	68.6 (65.8–71.3)
Reported post-vaccination side effects *(multiple answers allowed)*		
Injection site pain or swelling	200	58.8 (53.5–63.9)
Mild and transient skin allergy	19	5.6 (3.6–8.6)
Fever	168	49.4 (44.1–54.7)
Headache	71	20.8 (16.9–25.5)
Localised muscle pain	101	29.7 (25.1–34.8)
Tiredness	25	7.4 (5.0–10.6)
Other	6	1.8 (0.8–3.8)
Perceived effectiveness of influenza vaccination		
Very effective	153	14.1 (12.2–16.3)
Effective	511	47.2 (44.2–50.2)
Moderately effective	381	35.2 (32.4–38.1)
Ineffective	33	3.1 (2.1–4.3)
Very ineffective	4	0.4 (01.–1.0)
Willingness for subsequent influenza vaccination		
Definitely	444	41.0 (38.2–44.0)
Maybe	459	42.4 (39.5–45.4)
Undecided	147	13.6 (11.6–15.8)
Probably not	26	2.4 (1.6–3.5)
Definitely not	6	0.6 (0.2–1.3)

CI – Confidence Interval

Table 3. Comparison of demographic and work factors with influenza vaccination uptake.

Characteristic	Vaccinated (363) n (%)	Unvaccinated (719) n (%)	Total (N=1082)	*p*-value
Gender				
Male	51 (29.8)	120 (70.2)	171	
Female	312 (34.2)	599 (65.8)	911	0.26
Age group (years)				
20–29	63 (33.9)	123 (66.1)	186	
30–39	153 (31.0)	340 (69.0)	493	
40–49	72 (29.3)	174 (70.7)	246	<0.001*
≥50	75 (47.8)	82 (52.2)	157	
Professional qualification				
Certificate in Nursing	88 (41.5)	124 (58.5)	212	
Advanced/Diploma in Nursing	223 (31.9)	475 (68.1)	698	
Undergraduate	43 (31.4)	94 (68.6)	137	0.03*
Postgraduate or higher	4 (16.7)	20 (83.3)	24	
Other[#]	5 (45.5)	6 (54.5)	11	
Job position				
Nursing officer or higher	25 (44.6)	31 (55.4)	56	
Senior/Staff nurse	260 (31.0)	578 (69.0)	838	
Assistant nurse	74 (41.6)	104 (58.4)	178	0.01*
Other[##]	4 (40.0)	6 (60.0)	10	
Workplace				
Hospital	280 (33.0)	569 (67.0)	849	
Health center/clinic	80 (38.1)	130 (61.9)	210	0.04*
Other[###]	3 (13.0)	20 (87.0)	23	
Work experience (years)				
≤5	49 (30.6)	111 (69.3)	160	
6–10	79 (31.2)	174 (68.8)	253	0.37
>10	235 (35.1)	434 (64.9)	669	
Work Sector				
Government	342 (35.1)	633 (64.9)	975	<0.001*
Private	21 (19.6)	86 (80.4)	107	

*Significant p values using Pearson's Chi-square test.

[#]includes Basic nursing course or GCE O level.

[##]includes Nursing Lecturer, Nursing Senior Assistant Professors.

[###]includes non-hospital or non-health center/clinic settings e.g. Health Promotion Centre, School health, and Higher educational institutions.

Factors contributing to vaccination uptake

On assessing nurses' perceived knowledge regarding effectiveness of influenza vaccination, a large proportion agreed that the vaccine was very important in preventing influenza outbreaks in the country (80.6%) and at the workplace (80.2%), as well as in reducing risk of transmission to colleagues (80.3%), patients (80.3%), family and friends (79.6%), and oneself (74.2%). In regards to factors affecting decision making to receive the influenza vaccination, majority (>75%) agreed that they would obtain it if they were advised or received a directive by the government, national professional bodies, employer, or supervisor. These were comparatively higher when compared to if they were advised by family, friends or colleagues (55%–58%). When asked about most important factors that would affect their decision in receiving future vaccinations, the top four compelling reasons were severity of influenza-related complications (62.5%), global number of infections of influenza (45.8%), sudden mutation of virus (42.3%), and expert opinion (38.2%).

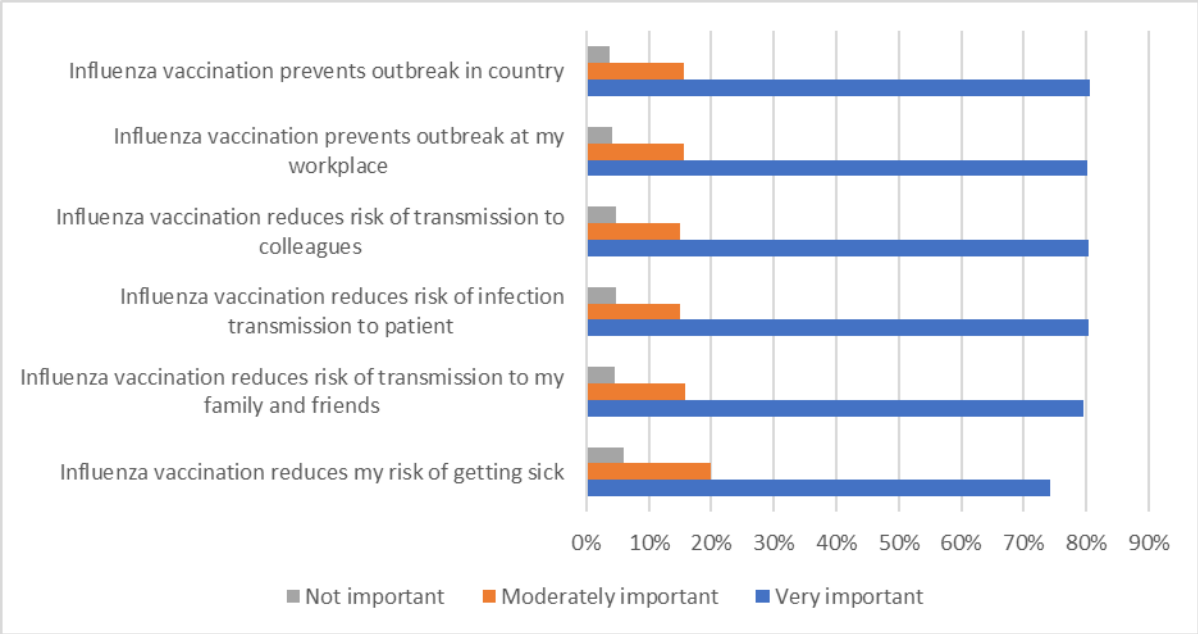

Figure 2. Factors influencing nurses' decision to receive influenza vaccination: Perceived beliefs on effectiveness of influenza vaccination

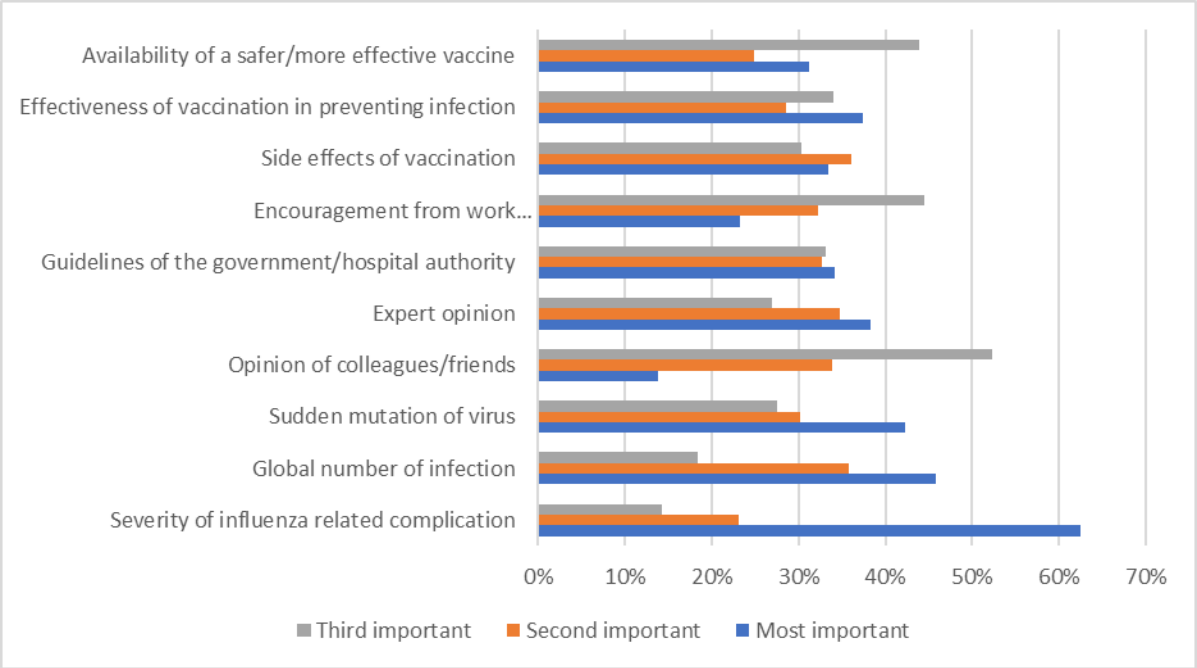

Figure 3. Factors influencing nurses' decision to receive influenza vaccination: Perceived factors affecting decision for receiving influenza vaccination

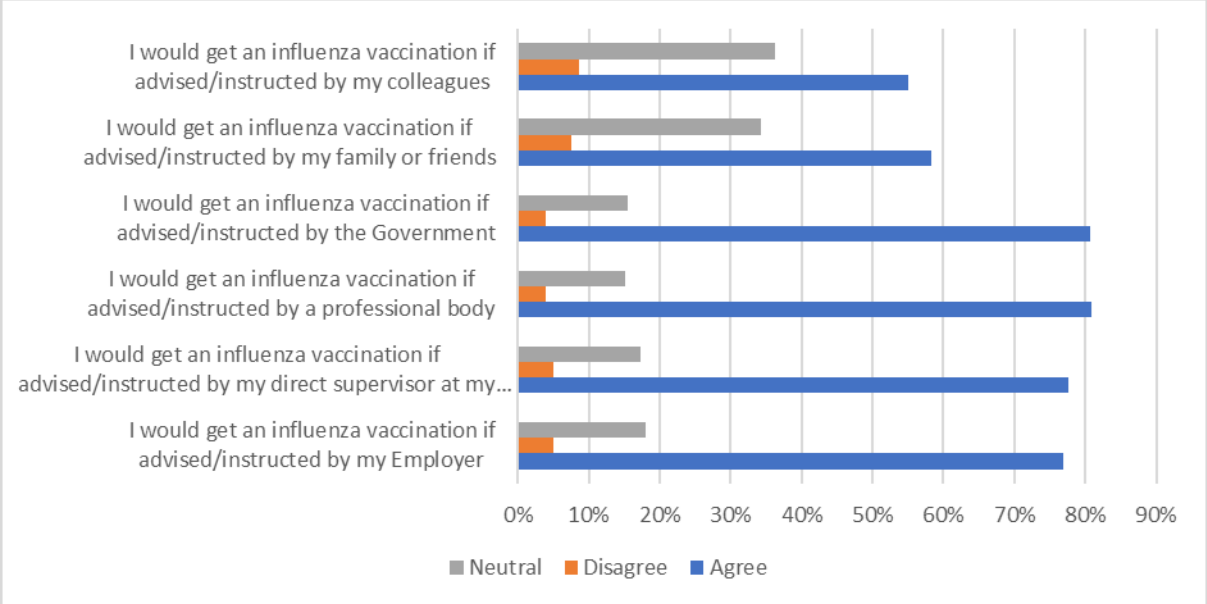

Figure 4. Factors influencing nurses' decision to receive influenza vaccination: Perceived facilitators for receiving influenza vaccination

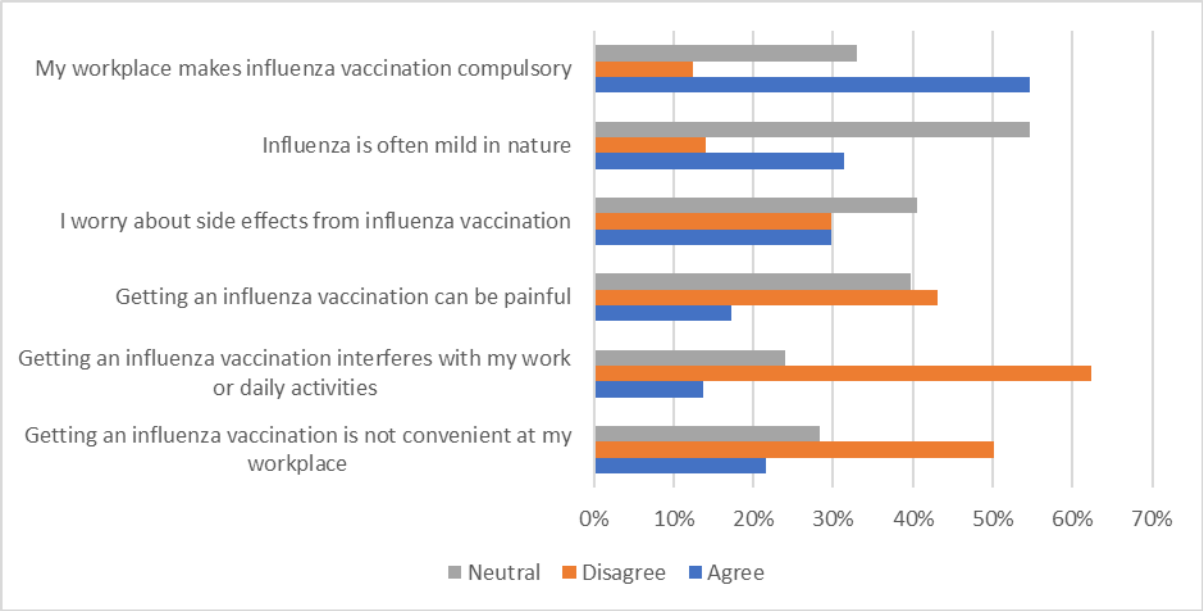

Figure 5. Factors influencing nurses' decision to receive influenza vaccination: Perceived barriers for receiving influenza vaccination

Discussion

The study findings revealed characteristics associated with influenza vaccination uptake among nursing staff in Brunei Darussalam, as well as their perception and knowledge on effectiveness of the vaccine and likelihood of receiving future vaccination. Healthcare workers in Brunei Darussalam are highly encouraged to obtain their influenza vaccination on an annual basis to reduce their risk of contracting influenza virus and transmitting it to other members of staff or patients. As the practice is voluntary with no penalty for being unvaccinated, it is not surprising that this survey reported a low prevalence of 33.5% of nurses who had received their influenza vaccination in the past one year. This is similar to HCW influenza vaccination uptake findings from other countries[18-21]. Vaccinated and unvaccinated HCWs were analyzed further for statistically significant characteristics, and this study found that there was a higher number of vaccinated HCWs who were of older age (>50 years old) (p <0.001), had lower nursing qualifications (p =0.03), held senior nursing positions (p =0.01), and worked in a hospital setting in the government sector (p =0.04; p <0.001). Older age appeared to be directly related to vaccine acceptance, as seen in other studies too[22,23], likely because this group perceived themselves to be more susceptible to the influenza virus than if they were not vaccinated, compared to younger nurses. In contrary to other study findings whereby nurses with higher levels of nursing education appeared to be more positively correlated with vaccine

acceptance[22,24], our study found that nurses with higher qualification were more likely to be unvaccinated.

This study showed similarities with findings of other studies regarding facilitators and barriers for vaccination uptake. Facilitators were perception of risk and benefit to self and others, and prevention of disease outbreak in the workplace whilst barriers were low risk perception for transmission of influenza virus, belief that influenza was a mild disease, inconvenience of getting the vaccination because of work activities or lack of accessibility to a vaccination facility[17,25,26].

Recent studies during the COVID-19 pandemic saw an increase in HCWs' intention and uptake for influenza vaccination as a way to mitigate the adverse impact of severe acute respiratory infections thereby reducing case burden on the healthcare system[13,27-29]. Similar findings were observed in a recent local study where influenza vaccination coverage increased to 67.3% among HCWs, and in particular 63.3% in nurses[30]. These improved intention and increased coverage of influenza vaccination among HCWs are encouraging and indicates a better health seeking attitude.

This study's main limitation was the use of a self-reported and online questionnaire with response being on a voluntary basis, and therefore was likely to contribute to a low response rate (36%) and some reporting bias. Moreover, data collection was carried out in 2017, and this may be viewed as outdated data (at the time of manuscript printing) particularly after the global pandemic of COVID-19 which saw an increase in vaccination uptake for both COVID and influenza vaccinations among HCWs. However, as this was the first research of its kind for HCWs in Brunei Darussalam, which also received a significant response from 1082 nurses, the research team felt the findings would be useful as published material for future reference and study comparisons.

Conclusion

This study identified that there is sub-optimal uptake of influenza vaccination among nursing staff in Brunei Darussalam, with only 35% vaccinated in the past one year. In contrast to this, during the COVID-19 global pandemic, this prevalence increased to 67.3%. This significant difference shows that a global health threat, such as a pandemic, can positively affect vaccination attitudes. The emergence and co-circulation of a new respiratory virus together with the influenza virus can cause an increased perception of the importance of influenza vaccination

among health professionals, and therefore leading to greater adherence to vaccination. Numerous studies have supported that the perceived level of a health threat is a strong predictor of an individual's intention to engage in preventative behavior.

In line with WHO efforts in striving towards a public health global convergence to eradicate vaccine-preventable infectious diseases, HCWs play an important role as vaccine ambassadors, and their acceptance of vaccination can have a huge impact on the general public. HCWs who are vaccinated themselves are more likely to advise a patient, relative, friend or colleague to get vaccinated. Since 2017, the Ministry's occupational health practice has been to increase uptake of influenza vaccination in HCWs. One of the strategies is by 'nudging' them through advice and counseling on the benefits of receiving the vaccination, when they are consulted in the Occupational Health Clinic for pre-employment medicals[30]. Registered nurses in Brunei Darussalam are mandated to undergo medical fitness examination for licensing purposes every three years at the Occupational Health Clinic. During this review, nurses are checked for vaccination status updates, including influenza vaccination. Those that are not up-to-date with their influenza vaccination are sent for on-site vaccination. As influenza vaccination is administered on an annual basis, future research with a longitudinal study would be beneficial to observe the trend of influenza vaccination uptake in response to any new and emerging or ongoing public health threats.

Ethical Approval Statement

The research was submitted to and approved by the Medical and Health Research Ethics Committee (MHREC), with the approval reference MHREC/MOH/2017/2/4, and permission was granted by the Nursing Board of Brunei (NBB) for the team to contact registered nurses.

Author Contributions

NM contributed to the data collection, initial statistical analysis of data, data analysis and interpretation, and manuscript writing. NI contributed to the data collection. AT contributed to the final statistical analysis of data, data interpretation, and manuscript writing. AL contributed to the study conception and design, and final manuscript writing for critical revisions of content and language editing.

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Conflicts of Interest

There was no conflict of interest in this research.

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