



Cognitive Barriers to COVID-19 Vaccine Uptake Among Older Adults

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The COVID-19 pandemic has resulted in tremendous loss of life. As of late-July 2021, there have been more than 191 million confirmed cases and over 4.1 million deaths recorded (1). Although most nations have developed some competency in COVID-19 containment (2–4), there are new challenges. The continual spread of COVID-19 has resulted in new variants (5–7). These new variants are posited to have a significantly higher transmissibility (8–10), with higher fatality rates (11, 12).

With complete eradication of the COVID-19 virus seeming highly unlikely, the shift for healthcare experts is now to reduce this pandemic into a state of mild disease endemicity (13–17). Vaccines play an essential role in this transition (14, 16).

Vaccines provide protection in a few crucial ways. In its most effective form, it serves to prevent natural infection; if immunity response following the vaccine does not prevent natural infection, it may still attenuate virus pathology, reducing the infectiousness and/or severity of disease symptoms (18). Only a while ago the world was racing towards developing a vaccine for this devastating disease (19), currently, with vaccines in hand, countries struggle to have significant portions of their population vaccinated (20–23). In order to achieve herd immunity through vaccines of 95 percent efficacy, calculations suggest about 63–76% of the population would have to be vaccinated (24). This range increases to 84–90% when including a safety margin (24). This safety margin is perhaps needful given a reduced efficacy against new COVID-19 variants observed in emerging reports (25–27).

The COVID-19 virus has been especially dangerous for older adults. Studies have shown the virus causing worse outcomes and having a higher mortality rate among older adults (28, 29). This is perhaps unsurprising given the known susceptibility of older adults to other infectious diseases (30, 31). Against the backdrop of global ageing trends, this is particularly concerning. The population of individuals aged 65 and over is growing faster than any other age group (32). Globally, there are over 727 million persons aged 65 years and over (33). With a sizable older adult population in many countries, and due to COVID-19's implications on the elderly, countries have consequently prioritised vaccinating older adults (34–36).

The collective impact of having substantial older adult populations, the elderly being more vulnerable to COVID-19, and the need to have high percentages of these senior vaccinated, beckons us to consider the barriers to inoculation among the elderly. Emerging research has identified demographic characteristics of older adults hesitant in receiving the COVID-19 vaccine. These older adults generally received less years of formal education and had less social contact (37, 38), a pattern also observed among the general population (39, 40). However, beyond demographic characteristics and factors, research on the specific beliefs held by these older adults have been sparse. Cognitive factors such as misconceptions and appraisal play a pivotal role in shaping health behaviours (41), including vaccination uptake. Efforts to modify an individual's health behaviour must take these cognitive factors into account, addressing those that are deemed relevant to the individual (42). Older adults are a population with specific characteristics (43), and with it, specific beliefs and cognitive barriers. Ergo, by assessing the beliefs of these hesitant older adults regarding COVID-19 and its vaccine, health messages and targeted interventions can be introduced more

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effectively. In the paucity of existing literature, we highlight emerging research and draw from literature on other vaccine hesitations among older adults, so as to make sense of potential cognitive barriers to COVID-19 vaccine uptake among seniors.

Referring to previous literature, we posit that cognitive barriers to vaccination among the elderly may be explained through three broad categories: (1) misconceptions of virus treatment, (2) misconceptions of vaccines, and (3) misappraisal of infection threat.

MISCONCEPTIONS OF VIRUS TREATMENT

The medical care of older adults often involves the management of chronic illnesses. Typically, therapeutic interventions for chronic illnesses consist of prescribed medication. As health problems tend to accumulate with age, older adults often have multiple comorbidities and are required to consume a variety of medication. Polypharmacy—the concomitant use of multiple drugs by a single individual—is an issue in present models of healthcare (44–46). The ubiquitous use of prescribed drugs in older adults health management may hence frame these older adults' understanding of viruses like the COVID-19, thinking that they may be treated through medications readily prescribed by doctors (47). Consequently, older adults with this misconception may not view vaccination as necessary. This notion aligns with schema theory, which posits that when new information becomes available (i.e., COVID-19 vaccination), a person tries to fit this new information into the pattern which he/she had used in the past to interpret information regarding a similar situation (48). Similarly, as the healthcare regimen of older adults often involve the reduction and management of *existing* conditions, the preventive role vaccinations play may not be readily understood. Some older adults may see the COVID-19 vaccine as means to cure or manage disease symptoms, needed only by individuals who have contracted the virus (47, 49). Continuing on this notion of cognitive framing, regular prescription of a healthy lifestyle to combat chronic illness may also lead some to think that they may turn to these as alternatives to the vaccine (50, 51). They may form a misbelief that robust immunity from the COVID-19 virus may be achieved through exercising, eating healthy, taking vitamins, or avoiding sick people (49, 52).

MISCONCEPTIONS OF VACCINES

Vaccination side effects such as fever, chills, fatigue and swelling of lymph nodes are typical. The introduction of a foreign substance into the body elicits an immune response, and while certain individuals may not exhibit these side effects, its presence in mild forms does not warrant immediate concern. Immune response following vaccination is important, generating the appropriate antibodies to fight off future infections. While unpleasant, some older adults may view potential COVID-19 vaccine symptoms disproportionately negative (53). Some may misconstrue these side effects as “sickness,” and mislabel the COVID-19 vaccine as disease-causing (49, 54). Even when these side-effects are appreciated as normative biological

responses, some older adults may feel that their general frailty and/or ailments exclude them from vaccine suitability (47). Given the coverage on COVID-19 vaccine side effects such as blood clotting disorders from the Oxford AstraZeneca vaccine (55) and myocarditis associations with the Pfizer-BioNTech and Moderna vaccines (56, 57), this may perpetuate the misnomer that only fit individuals are suited for COVID-19 vaccines. Some older adults may also have the misconception that the COVID-19 vaccine is primarily for people travelling overseas and those who frequent crowded settings (47, 49), a misconception possibly derived from extensive media coverage on restricted air travel and safe distancing measures. While greater contact with others and travel does increase the likelihood of infection, infections do occur domestically and within small groups.

APPRAISAL OF INFECTION THREAT

Perceived disease susceptibility and severity of health threat form two important tenets of health behaviour engagement. According to the Protection Motivation Theory (58), these two components underpin overall threat appraisal. Working in tandem with perceived coping efficacy, they result in either adaptive (e.g., adopting health behaviour) or maladaptive responses (i.e., denial of health threat).

Perceived susceptibility reflects the appraisal of subjective risk to a negative situation (59, 60), such as an infection. Motivation to forgo pleasurable behaviours and engage in inconvenient protective health behaviour is in part driven by greater perceptions of infection susceptibility (61–65). Over the course of the pandemic, countries have developed and implemented various measures aimed at containing COVID-19 infection cases. In countries where the infection curve has been flattened or have lower incidences, perception of infection susceptibility may be reduced, and these populations may not feel the pressure to be vaccinated (21, 54). Previous research on the influenza vaccine have also found past episodes of influenza infection tended to substantiate notions of disease susceptibility (47). A lack of past COVID-19 infections and low incidence of community infections may lead some to trivialise the probability of COVID-19 infection, and hence may not be willing to be vaccinated.

Perceived health threat severity may be evaluated through group comparisons. When considering one's vulnerability to a particular disease, a stereotypical image of a high-risk group emerges (66, 67). Following which, a process of social comparison occurs, assessing similarities and differences between this stereotypical group and oneself (68). Inaccurate inferences impaired by self-enhancement biases may shape perceived vulnerability towards infection. For example, older adults who did not identify as being old or frail were less likely to abide by government guidelines to protect against overheating, trivialising potentially severe health implications; this was despite them being considered at risk objectively (69). Similarly, older adults who did not identify as sickly and frail were found to refuse vaccination on grounds that they had generally been

healthy (49, 54), despite being considered at risk objectively (28, 29).

Consequently, behaviour engagement are held to be more likely when an individual perceives oneself to be faced with a health threat to which he/she is susceptible and which is perceived to be severe (41, 58).

CONCLUSION AND IMPLICATIONS

COVID-19 fatigue has certainly been experienced by many, yet, vigilance and tenacity is still needful. Given the sizable population of older adults and their vulnerability to the disease, having a large percentage of these older adults vaccinated is fundamental. Recent research suggest that the willingness to vaccinate against COVID-19 might be systematically underestimated, and introducing certain virus-related information (i.e., information about herd immunity) significant increases vaccination willingness (70). This highlights the modulating capability of nuanced messaging on vaccination willingness. Identifying subpopulations and demographic descriptors of unvaccinated seniors are important, however, it is equally important to understand the misconceptions, concerns and fears *specific* to this group of elderly individuals. When addressing the aforementioned barriers, it is also necessary to consider appropriate and accessible channels. Previous research has suggested that targeted messaging and intervention may be more effective when introduced through a family doctor

(54), grassroots volunteers from the community using a multi-component approach [i.e., home visits, telephone and leaflets reminders; (71, 72)], and through traditional media such as television and newspapers (73). Further, as older adults may be more susceptible to misinformation (74, 75), establishing that messages through said channels are verified—whether through government (76) or journalist intervention (77)—and education on digital literacy (78, 79) may serve as potential counters.

AUTHOR CONTRIBUTIONS

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