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COVID-19 vaccination uptake in people with epilepsy in wales

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ABSTRACT

Purpose: People with epilepsy (PWE) are at increased risk of severe COVID-19. Assessing COVID-19 vaccine uptake is therefore important. We compared COVID-19 vaccination uptake for PWE in Wales with a matched control cohort.

Methods: We performed a retrospective, population, cohort study using linked, anonymised, Welsh electronic health records within the Secure Anonymised Information Linkage (SAIL) Databank (Welsh population=3.1 million).We identified PWE in Wales between 1st March 2020 and 31st December 2021 and created a control cohort using exact 5:1 matching (sex, age and socioeconomic status). We recorded 1st, 2nd and booster COVID-19 vaccinations.

Results: There were 25,404 adults with epilepsy (127,020 controls). 23,454 (92.3%) had a first vaccination, 22,826 (89.9%) a second, and 17,797 (70.1%) a booster. Comparative figures for controls were: 112,334 (87.8%), 109,057 (85.2%) and 79,980 (62.4%).PWE had higher vaccination rates in all age, sex and socioeconomic subgroups apart from booster uptake in older subgroups. Vaccination rates were higher in older subgroups, women and less deprived areas for both cohorts. People with intellectual disability and epilepsy had higher vaccination rates when compared with controls with intellectual disability.

Conclusions: COVID-19 vaccination uptake for PWE in Wales was higher than that for a matched control group.

1. Introduction

The Coronavirus disease 2019 (COVID-19) vaccination programme has had a dramatic effect on reducing COVID-19 hospitalisations and deaths. The programme started in Wales and the UK on 8th December 2020. As of 8th June 2022, 2.4 million individuals in Wales (total population 3.1 million) and 50.0 million individuals in the UK (total population 66.2 million) have had at least two COVID-19 vaccinations [1].

In the UK, the joint committee on vaccination and immunisation set nine priority groups for COVID-19 vaccination. After care home residents and workers, age was prioritised in decreasing five-year groups. People with epilepsy (PWE) aged 16–65 and people with moderate or severe intellectual disability (ID) were prioritised in group 6 and were invited for vaccination from mid-February 2021 (older PWE were prioritised in line with their age) [2].

There is increasing evidence that the vaccines are safe in general and reduce the risk of severe COVID-19 [3]. The International League Against Epilepsy recommended that PWE receive COVID-19 vaccines [4]. There have been concerns that COVID-19 vaccines may cause adverse effects in PWE, particularly an increase in seizures, either directly or through vaccine induced fever, which can reduce seizure threshold [3,5,6]. As a result there may be reduced vaccine uptake in PWE [3].

A large UK study found an increased risk of severe COVID-19 for people with epilepsy (approximate hazard ratios of 1.6) [7]. It is therefore important to assess COVID-19 vaccine uptake so that measures can be taken to correct any areas of reduced uptake, in preparedness for

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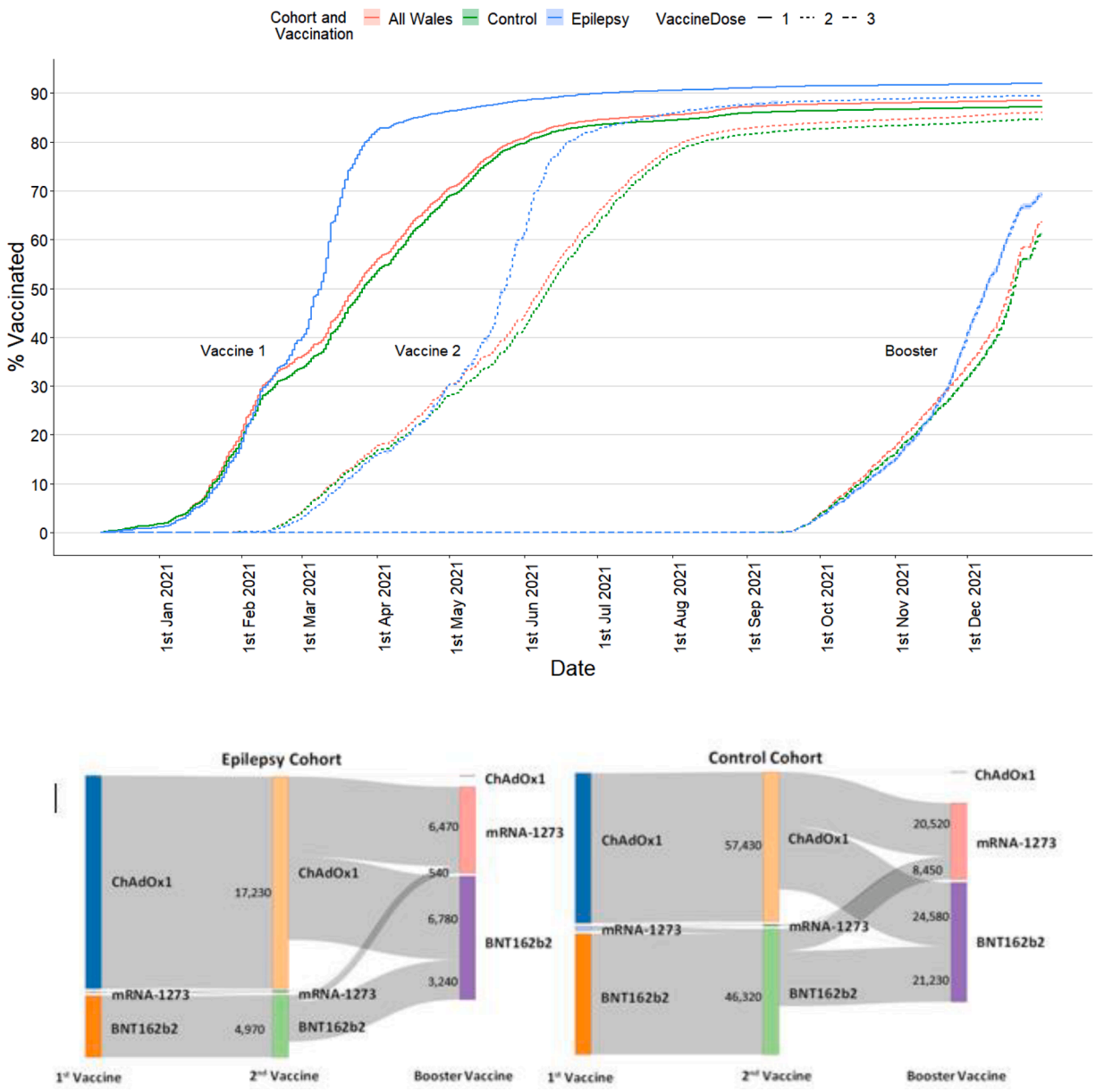

Fig. 1. (a) Vaccination uptake with time between 1st December 2020 and 31st December 2021. Blue lines represent people with epilepsy, green lines control (age, sex and deprivation matched) and red lines represent the whole Welsh population. Solid lines are for the first COVID-19 vaccination, short dashed lines the second vaccination and long dashed lines the booster vaccination.
(b) Sankey diagram showing COVID-19 vaccine type as a proportion of the Epilepsy and Control group. The width of the bars is proportional to the numbers in each group and the numbers represent the number of individuals who had the vaccine (rounded to the nearest 10).ChAdOx1 (Oxford–AstraZeneca); mRNA-1273 (Moderna); BNT162b2 (Pfizer).

any future COVID-19 or similar waves [7]. In this retrospective, population-level study we aimed to assess COVID-19 vaccine uptake in adults with epilepsy in Wales, comparing with matched controls.

2. Method

We used the Secure Anonymised Information Linkage Databank, which contains anonymised, population-scale, routinely-collected healthcare records [8]. These include hospital admission and demographic data for the complete Welsh population (3.1 million) and primary care records for 85% of the population. We used data within the controlling COVID-19 through enhanced population surveillance and intervention (Con-COV) project [8].

We identified adults with epilepsy living in Wales before or during 1/3/2020 to 31/12/2021 using a previously validated algorithm [9]. We created a control cohort using exact 5:1 matching on sex, age, and area-based socioeconomic deprivation quintile measured using the Welsh Index of Multiple Deprivation (WIMD) version 2019. We recorded primary care diagnoses of intellectual disability and 1st, 2nd and booster COVID-19 vaccinations in cases and controls between 8/12/2020 and 31/12/2021 [7].

We used Chi-Squared tests to compare proportions and R (version 4.1.3) for statistical analysis.

We collaborated with Epilepsy Action, a leading UK epilepsy charity, on project design, results interpretation and data dissemination.

This study was approved by the SAIL independent Information Governance Review Panel (ref 0911). SAIL projects using anonymised, routinely collected data do not require NHS research ethics committee approval.

Table 1
Numbers and proportions of individuals (adults aged 16+) vaccinated in epilepsy and control (matched on age, sex and deprivation) group. Proportions vaccinated are higher for all epilepsy subgroups apart from boosters in those aged 56–75, 66–75 and 76+ and 2nd vaccines in those aged 76+ (grey shading). V1=1st COVID-19 vaccination; V2=2nd COVID-19 vaccination and Booster=3rd (booster) controls. *Deprivation measured using WIMD (Welsh Index of Multiple Deprivation) quintiles, where quintile 1 is most deprived and quintile 5 is least deprived. +indicates p<0.05, ++indicates p<0.001 and +++indicates p<0.0001 when comparing epilepsy with control subgroups (Chi-Squares tests, see Supplementary Table 3 for list of actual p-values.)

		People with epilepsy				Control			
		Total	*V1*	*V2*	*Booster*	*Total*	*V1*	*V2*	*Booster*
Total		25,404	23,145	22,361	17,065	127,020	109,524	105,787	75,297
		100%	91.1%$^{+++}$	88.0%$^{+++}$	67.2%$^{+++}$	100%	86.2%	83.3%	59.3%
Sex	*Female*	12,499	11,531	11,141	8,560	62,495	55,457 88.7%	53,742 86.0%	38,938
		49.2%	92.3%$^{+++}$	89.1%$^{+++}$	68.5%$^{+++}$	49.2%			62.3%
	Male	12,905	11,614	11,220	8,505	64,525	54,067 83.8%	52,045 80.7%	36,359
		50.8%	90.0%$^{+++}$	86.9%$^{+++}$	65.9%$^{+++}$	50.8%			56.3%
Deprivation*	WIMD 1 (most deprived)	6,879 27.1%	6,025	5,712	4,016	34,395	28,342 82.4%	26,986 78.5%	17,610
			87.6%$^{+++}$	83.0%$^{+++}$	58.4%$^{+++}$	27.1%			51.2%
	WIMD 2	5,896 23.2%	5,356	5,183	3,882	29,480	25,463 86.4%	24,556 83.3%	17,104
			90.8%$^{+++}$	87.9%$^{+++}$	65.8%$^{+++}$	23.2%			58.0%
	WIMD 3	4,629 18.2%	4,245	4,128	3,196	23,145	19,864 85.8%	19,237 83.1%	13,800
			91.7%$^{+++}$	89.2%$^{+++}$	69.0%$^{+++}$	18.2%			59.6%
	WIMD 4	4,093 16.1%	3,829	3,737	2,966	20,465	18,175 88.8%	17,741 86.7%	13,259
			93.5%$^{+++}$	91.3%$^{+++}$	72.5%$^{+++}$	16.1%			64.8%
	WIMD 5 (least deprived)	3,907 15.4%	3,690	3,601	3,005	19,535	17,680 90.5%	17,267 88.4%	13,524
			94.4%$^{+++}$	92.2%$^{+++}$	76.9%$^{+++}$	15.4%			69.2%
Age	16–25	3,177 12.5%	2,770	2,622	1,635	15,885	12,396 78.0%	11,182 70.4%	4,393 27.7%
			87.2%$^{+++}$	82.5%$^{+++}$	51.5%$^{+++}$	12.5%			
	26–35	4,229 16.6%	3,639	3,462	2,300	21,145	16,244 76.8%	15,267 72.2%	7,568 35.8%
			86.0%$^{+++}$	81.9%$^{+++}$	54.4%$^{+++}$	16.6%			
	36–45	3,966 15.6%	3,516	3,374	2,386	19,830	16,203 81.7%	15,626 78.8%	9,596 48.4%
			88.7%$^{+++}$	85.1%$^{+++}$	60.2%$^{+++}$	15.6%			
	46–55	4,494 17.7%	4,147	4,034	3,195	22,470	19,953 88.8%	19,570 87.1%	14,990
			92.3%$^{+++}$	89.8%$^{+++}$	71.1%$^{+++}$	17.7%			66.7%
	56–65	3,957 15.6%	3,735	3,659	3,029 76.5%$^{+}$	19,785	18,264 92.3%	18,024 91.1%	15,435
			94.4%$^{+++}$	92.5%$^{+++}$		15.6%			78.0%
	66–75	3,232 12.7%	3,109 96.2%$^{+}$	3,064 94.8%	2,696 83.4%$^{+}$	16,160	15,379 95.2%	15,246 94.3%	13,737
						12.7%			85.0%
	76+	2,349 9.2%	2,229 94.9%	2,146 91.4%$^{+}$	1,824	11,745 9.2%	11,085 94.4%	10,872 92.6%	9,578 81.5%
					77.7%$^{+++}$				
Intellectual Disability		3,939 15.5%	3,630	3,517	2,700	2,019 1.6%	1,706 84.5%	1,613 79.9%	1,042 51.6%
			92.2%$^{+++}$	89.3%$^{+++}$	68.5%$^{+++}$				

3. Results

We identified 25,404 adults with epilepsy (127,020 controls). The mean age in years (standard deviation) for the epilepsy, control and adult Welsh cohorts were 49.4 (18.8), 49.4 (18.8), and 50.4 (19.5). Fig. 1(a) shows vaccination uptake with time. At the end of the study 23,145 (91.1%) PWE had a first vaccination dose, 22,361 (88.0%) a second dose, and 17,065 (67.2%) a booster. Comparative figures in the controls were 109,524 (86.2%), 105,787 (83.3%) and 75,297 (59.3%). Comparative figures in the entire Welsh population were 1,711,542 (87.5%), 1,655,815 (84.7%) and 1,204,695 (61.6%). Table 1 and supplementary Table 1 show a breakdown of vaccination rates by age, sex and deprivation subgroups.

There were 811(3.2%) and 373(0.3%) people from the epilepsy and control cohort living in care homes. Of people with intellectual disability there were 382(9.7%) and 69(3.4%) in the epilepsy and control cohort living in care homes.

4. Discussion

People with epilepsy (PWE) in Wales had higher uptake of COVID-19 vaccinations, when compared with matched controls and the whole Welsh population, to the end of 2021. Vaccination uptake followed the national prioritisation schedule, with PWE under the age of 65 being prioritised ahead of people without epilepsy (or other relevant comorbidities) in this age group [2]. This is reassuring, given the increased risk of severe COVID-19 in PWE [7].

Vaccination rates were higher in PWE for all age, sex and deprivation subgroups apart from booster rates in the 55–65, 65–75 and 76 and over subgroups where rates slightly lower. 76.5%, 83.4% and 77.7% of PWE aged 55–65,66–75 and 76+ received booster vaccines in the study period, compared with 78.0%,85.0% and 81.5% (p-values 0.045,0.023,0.00001) in controls of the same age. 91.4% of PWE in the 76+ group had second vaccinations compared to 92.6% in the control group (p-value 0.049). Given the importance of booster vaccinations for older people, and further rounds of booster vaccinations in 2022, this finding is relevant [10]. Efforts should be made to address any concerns or barriers to ensure that older PWE continue to get adequate vaccination.

A higher proportion of PWE were resident in care homes when compared to controls. Care home residents had highest priority in the vaccination schedule in Wales. However uptake between PWE and controls was similar at the beginning of the vaccination schedule with differences occurring at the time when epilepsy was being prioritised for vaccination (Fig. 1).

People with intellectual disability (ID) have an increased risk of severe COVID-19 and so it is reassuring that the uptake in the group of PWE and ID was higher than the group of PWE (and controls) as a whole. [7] Additionally, people with ID and epilepsy had a higher uptake than those with ID in the control group. This is a positive finding and may reflect public messaging campaigns to carers and families of people with ID. In addition, community ID services in some regions of Wales actively supported attendance at vaccination clinics or provided mobile vaccination services to those unable to attend.

The overall patterns of vaccination uptake were similar to those across the UK with older, female and less deprived people more likely to

get vaccinated [11].

First and second vaccinations were almost all ChAdOx1 (Oxford–AstraZeneca) or BNT162b2 (Pfizer) and booster vaccinations were almost all BNT162b2 or mRNA-1273 (Moderna) vaccines in line with UK vaccination policy [Fig. 1 (b)]. Proportionally more PWE had ChAdOx1 first and second vaccines when compared with controls. This reflects that more PWE were vaccinated earlier in 2021 when proportionally more ChAdOx1 vaccines were used. There have been genuine concerns about the different efficacies and adverse effect profiles of the different vaccines within the epilepsy and wider community which motivated this part of our analysis, however further research is needed to assess the impact of individual vaccine types.

The proportion of people vaccinated decreased with each successive vaccination dose. This was across all subgroups and ages in the epilepsy, control and all Wales cohorts (Table 1, supp Table 1) and has been similar in other countries [12]. Again this finding is important given ongoing COVID-19 vaccination campaigns and probably further waves of COVID-19. Future work is needed on whether COVID-19 vaccines reduce the risk of severe COVID in PWE.

4.1. Strengths

To our knowledge, this is the first study to look at COVID-19 vaccine uptake in PWE at a population-level. We have rapidly analysed contemporaneous population-scale, primary care, demographic and vaccination data, using a previously validated algorithm for ascertaining PWE [9].

4.2. Limitations

Due to the nature of routinely-collected data we have not been able to assess additional factors that may influence vaccination uptake and/or risk of severe COVID-19. These include type and severity of epilepsy, seizure frequency, additional comorbidities, ethnicity, pregnancy status, and geographical variation [11].

We did not analyse COVID-19 deaths, adverse effects or vaccination uptake in other prioritised neurological disorders in this study.

A small number of individuals have had vaccinations after the end of our study period (approximately 3%, 6% and 25% additional first, second and booster vaccinations) [2].

Initially, we did not account for deaths or people moving out of Wales during the study period. However the 765 deaths or departures from the study area (509 deaths) in the epilepsy group and the 4,291 deaths or departures (1,586 deaths) in the control group did not significantly alter our main findings (supplementary Table 2).

5. Conclusion

COVID-19 vaccination uptake for PWE in Wales has been higher than that for matched controls and the Welsh population. This is reassuring given the increased risk of severe COVID-19 for PWE. There was slightly lower uptake of booster vaccines in older PWE when compared with controls. Continued vigilance is needed particularly with drop-off in vaccine uptake with each additional vaccine.

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This study makes use of anonymised data held in the Secure Anonymised Information Linkage (SAIL) Databank. We would like to acknowledge all the data providers who make anonymised data available for research. Approval for the use of data in this study, within the SAIL Databank, was granted by an independent information governance review panel (IGRP ref 0911).

The work described here is consistent with the Journal's guidelines for ethical publication. None of the authors have any relevant conflicts of interest to disclose.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.seizure.2023.04.006.

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