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TITLE : Patients with history of covid-19 had more side effects after the first dose of covid-19 vaccine

RUNNING TITLE : Side effects after first dose of COVID-19 vaccine

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KEY WORDS

COVID-2019 ; Pfizer-BioNTech COVID-19 vaccine ; COVID-19 vaccine ; vaccine reactogenicity ; SARS-CoV 2 ; side effects

1 INTRODUCTION

2 The coronavirus disease 2019 (COVID-19) pandemic continues to affect thousands people in
3 France and is responsible, to date, for nearly 85 000 deaths. Currently, only corticosteroid and
4 tocilizumab have so far proved to be effective in patients with severe forms of COVID-19,
5 and vaccination seems to be the most pertinent pharmacologic public health measure to
6 control the pandemic. The national COVID-19 vaccination program began in France at the
7 end December 2020. Pfizer-BioNTech, an ARN vaccine, was the first recommended in
8 France for over-50-years-old-healthcare-workers, or with high risk of severe COVID-19 and
9 for patients over 75 years of age [1]. In phase 1/2/3 of the studies conducted by Pfizer-
10 BioNTech, in vaccine recipients, reactogenicity symptoms were frequent, mostly mild to
11 moderate, commonly reported after the second dose [2–4]. However, patients with a previous
12 clinical or microbiologic diagnosis of Covid-19 were excluded.

13 We assessed the side effects after the first dose of Pfizer-BioNTech vaccine, comparing
14 patients with or without history of COVID-19.

15

16 METHOD

17 We conducted a prospective and observational, single center study in university tertiary care
18 hospital in Besançon, France. Eligible subjects were healthcare workers vaccinated with one
19 dose of Pfizer-BioNTech COVID-19 vaccine. From 27 January to 5 February 2021, an
20 anonymous questionnaire was proposed on site to each participant just before the second dose
21 of vaccine (between 21 to 28 days after the first one). Data collected were subject's
22 demographic characteristics, the occurrence and intensity of local (redness or pain at the
23 injection site) and/or systemic symptoms (fatigue, vomiting, diarrhoea, headache, chills,
24 fever, muscle pain, joint pain ...), and characteristics and data of prior COVID-19 disease. All
25 the data collected in the questionnaire are based on self-reported, including COVID-19

26 exposure status. Our questionnaire was developed on the basis of the FDA Center for
27 Biologics Evaluation and Research (CBER) guidelines on the toxicity classification scale for
28 healthy adults.

29 Comparisons of reactogenicity symptoms frequency between naive individuals, defined as
30 asymptomatic, COVID-antibody status unknown and participants with history of COVID-19
31 were performed. All variables were examined by univariate analysis using the chi-square or
32 Fisher's exact test, as appropriate. A p-value < 0.05 was considered significant.

33 Ethics approval and consent to participate: According to French legislation in this period, and
34 because no intervention was performed on patients, no written informed consent was given by
35 the patients Our study protocol followed the ethical guidelines of the declaration of Helsinki
36 and was approved by our institutional review board.

37

38 **RESULTS**

39 The questionnaire was completed by 311 of 351 healthcare workers vaccinated during the
40 study period (response rate, 89%). . The mean age was 55.4 ± 6.4 years and participants were
41 mostly women (60%). History of COVID-19 was reported in 20 participants (6.4%). Among
42 them, 19 had symptomatic COVID-19 confirmed by naso-pharyngeal RT-PCR, and only one
43 had positive serology without symptoms. None of them were hospitalised. The mean duration
44 between COVID-19 and first dose of vaccine was 10.3 ± 2 months. Twelve of 20 (60%)
45 participants did SARS-CoV2 serology and 8 were positive in a mean time of 8 ± 1 months
46 before the vaccination. A total of 229 participants (74%) reported at least one side effect. Of
47 the adverse reactions, 37% of participants reported systemic reaction (mainly fatigue (18%),
48 headache (14%) muscle pain (20%)), and 66% reported a local event, such as pain at the site
49 injection (63%) or erythema (8%). No side effects required additional medical attention.
50 Among participants with prior SARS-Cov-2 infection, 19/20 (95%) reported at least one
51 adverse event, 18 (90%) at least one local reaction and 13 participants (65%) systemic side

52 effects. Five participants had to lie down for 24-48 hours, and only one was granted sick
53 leave.
54 There was a relationship between history of COVID-19 and reactogenicity symptoms
55 frequency. Vaccine recipients with prior COVID 19 infection experienced systemic side
56 effects with a significantly higher frequency than naive patients (figure 1). However,
57 symptom intensity was not different between the 2 groups, excepted for headache (Table 1).

58
59

60 **DISCUSSION**

61 We herein report a comparative study of post-vaccination adverse events between vaccine
62 recipients with a COVID 19 pre-existing immunity and naive individuals.

63 Reactogenicity is a part of the safety profile evaluation of a given vaccine. It refers to the
64 potential for expected and unexpected local or systemic adverse reactions after vaccine
65 administration. Overall, reactogenicity events after a first dose of Pfizer-BioNTech COVID-
66 19 vaccine were common as previously described in pharmaceutical studies conducted by
67 Pfizer-BioNTech [3–5]. Among all studied vaccine recipients, 84.7% reported at least one
68 local injection site event and 77.4% at least one systemic reaction [3]. Pain at the injection
69 site, fatigue, headache and muscle pain were the most common adverse events in these studies
70 [2–4]. Symptoms usually peak by day 2 after vaccination and resolve by day 7 [4]. In our
71 study, the rate of reported adverse events was lower than those in the safety studies. This is
72 probably related to the fact that this is a real-world study, patients are warned in advance of
73 vaccine side effects, and that they are self-reported and unsolicited.

74 Our study showed that vaccine recipients with a COVID 19 pre-existing immunity
75 experienced significantly more frequent reactogenicity symptoms after the first vaccine dose
76 compared to naive individuals, especially systemic symptoms. In the Pfizer-BioNTech Phase

77 3 study, 1125/37586 (3%) patients had a positive serology for SARS-CoV2. Of these, 545
78 patients were in the vaccine group and 580 in the placebo one. Adverse events reported were
79 no more frequent in seropositive individuals [6].

80 In the last safety report of February 2021, the French National Agency for the Safety of
81 Medicines and Health Products reported 239 cases of adverse reactions in people with a
82 history of COVID-19 infection after the Pfizer-BioNTech vaccine [7]. The cases reported did
83 not appear to present any specific characteristics in terms of the reported reactions severity,
84 particularly reactogenicity. The proportion of patients who developed systemic reactogenic
85 effects seemed higher in case of a history of COVID-19 (63.2% vs 50.8%), but with a lower
86 severity. In contrast, in the current analyse, we did not report significant differences in
87 severities, except for headache. This can be explained by the small sample size.

88 In immunogenicity trials [2,4,5], the frequency and severity of reactogenicity symptoms were
89 higher after the second dose of vaccine than the first one except for vomiting and diarrhoea,
90 which were generally similar regardless of dose. For all age groups, fatigue, headache and
91 new/worsened muscle pain were most common.

92 Some recent studies have highlighted that a single dose of Pfizer-BioNTech vaccine elicited
93 rapid immune response in vaccinated individuals with pre-existing immunity, and with post-
94 vaccination antibody titers similar to or higher than those seen in naive participants who
95 received two doses of vaccine [8]. The authors of study also suggested that the vaccine
96 systemic reactogenicity after the first dose was more pronounced in people with pre-existing
97 immunity and appeared to be similar to the side effects reported for the second dose in phase
98 III vaccine trials [2]. These data, combined with current knowledge of the immunological
99 response to SARS-Cov-2 and the phenomena of reinfection, have led to a recent modification
100 of the vaccination strategy in France. According to the French Health Authority, people with a

101 medical history of COVID-19 should receive only one (mRNA or adenovirus-vectored)
102 vaccine dose except for immunocompromised patients (2 doses of vaccine) [9].

103

104 Some limitations should be highlighted. All data collected were self-reported. History of
105 positive SARS-CoV2 serology was also self-reported. It cannot be ruled out that subjects with
106 an asymptomatic and undocumented form of COVID-19 were erroneously included in the
107 "naive patients" group. Furthermore, the serology alone is not a sufficient marker of
108 protection. It only attest contact with SARS-CoV-2. Neutralizing antibodies titration may
109 provide evidence of a protective humoral response. However, this test was not performed in
110 our study. In addition, the small sample size of participants with a history of COVID-19
111 should lead to caution in interpreting the results.

112 To conclude, we found that vaccine recipients experienced more frequent reactogenicity after
113 a first dose of the Pfizer-BioNTech COVID-19 vaccine compared to naive individuals.

114 Further studies are needed to confirm these results.

115

116

117 **LEGENDS :**

118 **Figure 1 :** Vaccine associated side effects experienced after the first dose of vaccine (N=
119 311 individuals). The local side effects occur with comparable frequency while the systemic
120 symptoms are significantly more common in the individuals with history of COVID-19.

121 * $p < 0.05$

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124

125 **CONFLICT OF INTEREST : None**

126

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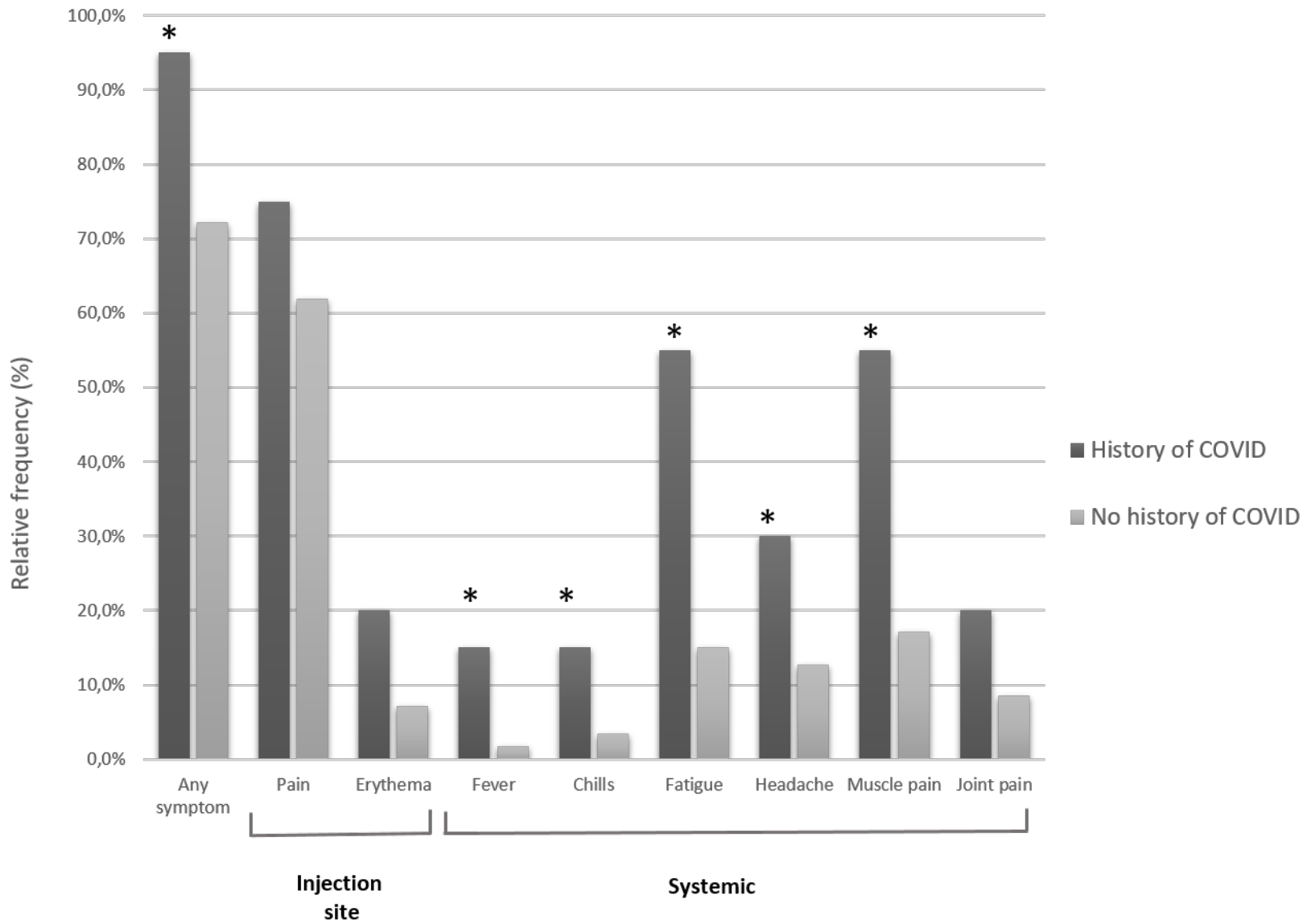


Table 1. Characteristics of patients, frequency and intensity of side effects after the first dose of vaccine.

Characteristics	No history of COVID (n=291)	History of COVID (n=20)	P value
Age, median [Q25-75]	58.2 [53.6-61.0]	55.7 [52.3-59.3]	0.36
Sex M/F	113/175	10/10	0.34
No symptoms, n (%)	81 (28)	1 (5)	0.025
Injection site symptoms	186 (64)	18 (90)	0.018
Pain	180 (62)	15 (75)	0.24
Mild	105 (58)	6 (40)	0.1
Moderate	69 (38)	7 (47)	
Severe	6 (3.3)	2 (13)	
Erythema	21 (7.2)	4 (20)	0.065
Mild	13 (62)	1 (25)	0.29
Moderate	8 (38)	3 (75)	
Severe	0	0	
Systemic symptoms	101 (35)	13 (65)	<0.01
Fever	5 (1.7)	3 (15)	0.01
Mild (38-38.4°C)	5 (100)	2 (66)	0.9
Moderate (38.5-38.9°C)	0	1 (33)	
Severe (>39°C)	0	0	
Chills	10 (3.4)	3 (15)	0.043
Mild	9 (90)	1 (33)	0.5
Moderate	1 (10)	1 (33)	
Severe	0	1 (33)	
Fatigue	44 (15)	11 (55)	<0.001
Mild	22 (50)	6 (55)	0.82
Moderate	14 (32)	4 (36)	
Severe	8 (18)	1 (9.1)	
Headache	37 (13)	6 (30)	0.042
Mild	25 (68)	2 (33)	0.042
Moderate	9 (24)	1 (17)	
Severe	3 (8.1)	3 (50)	
Muscle pain	50 (17)	11 (55)	<0.001
Mild	34 (68)	6 (55)	0.48
Moderate	9 (18)	2 (18)	
Severe	7 (14)	3 (27)	
Joint pain	25 (8.6)	4 (20)	0.1
Mild	18 (72)	1 (25)	0.11
Moderate	4 (16)	1 (25)	
Severe	3 (12)	2 (50)	