

Safe administration of inactivated SARS-CoV-2 vaccines in egg-intolerant adults with skin allergies

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Abstract: The current study is to determine the safety of inactivated severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccines in patients with skin allergies and egg intolerance but lacking laboratory evidence of egg allergy. This retrospective study included adults with skin allergies but lacking laboratory evidence of egg allergy who received two doses of the SARS-CoV-2 vaccines. Local and systemic reactions for 7 days following each vaccine dose were recorded during telephone interviews. 122 participants with skin allergies (mean age, 30±9.47 years) were enrolled. Egg-intolerant individuals had more anaphylactic reactions after receiving the vaccine than did egg-tolerant individuals (39.78% vs. 17.24%, $P < 0.05$). A higher titer of egg sIgG4 was associated with the increased risk of allergic responses after receiving the vaccine (P for trend = 0.008). Unusual pain and new or worsened skin rashes were common reactions, especially after the first dose. After adjustments, egg-intolerance was correlated with a higher risk of unusual pain ($P = 0.044$, adjusted odds ratio (aOR): 5.061, 95% confidence interval (CI): 1.047–24.457) and new or worsened skin rashes ($P = 0.041$, aOR: 9.109, 95% CI: 1.098–75.563) after the first injection. The results supported the overall safety of inactivated SAR-CoV-2 vaccines. Egg intolerance increased the risk of allergic reactions in adults with skin allergies but lacking laboratory evidence of egg allergy within 7 days of receiving the inactivated vaccine. These reactions were more frequent after the first dose and were positively associated with egg serum concentration.

Key words: egg intolerance; SARS-CoV-2; skin allergy; vaccines; adverse reactions

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1 Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), threatens public health. Vaccines can effectively reduce COVID-19-related morbidity and mortality. As vaccination campaigns progress, increasing adverse reactions are being reported^[1-2].

Although the safety of the SARS-CoV-2 vaccine has been demonstrated, the vaccine adverse events are still reported^[3]. Study has shown that the history of allergies enhances the incidence of anaphylactic reactions to the SARS-CoV-2 vaccine^[4]. Food is the most frequent triggers of anaphylaxis, as a widely consumed food in public life, egg has received much attention.

Ingestion of eggs and egg products by egg-sensitive

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individuals can cause far-reaching adverse responses from mild to life-threatening anaphylaxis^[5]. These reactions are generally divided according to their etiology into egg allergy (an immunoglobulin [Ig]E-mediated condition) or egg intolerance (a non-IgE-mediated condition associated with IgG)^[6]. Among IgGs, IgG4 is a main auxiliary diagnostic indicator of nonimmune-mediated reactions in clinical practice^[7]. Egg intolerance is more common in all age groups, which manifests as patients clinically presenting with allergic symptoms show egg specific immunoglobulin (sIg)E negative but egg sIgG4 positive, when performing serological testing^[8].

The safety of inactivated SAR-CoV-2 vaccines in these allergic patients remains unclear, especially in those with different types of allergies. Because allergic patients regularly exhibit skin symptoms, we retrospectively evaluated the responses of egg-intolerant adults with skin allergies but lacking laboratory evidence of egg allergy to inactivated SARS-CoV-2 vaccines to guide further investigations in determining an appropriate risk stratification in populations with allergies.

2 Materials and methods

2.1 Participants

We retrospectively reviewed patients' responses to inactivated SARS-CoV-2 vaccines developed by Corona Vac (SINOVAC, China) and BBIBO-CorV (SINO-PHARM, Beijing Institute & Wuhan Institute of Biological Products, China). All participants were enrolled consecutively at the Department of Dermatology at the Affiliated Hospital of Medical School, Ningbo University, from July 2021 to December 2021, diagnosed with skin allergies (mainly included allergic pathologies manifest as skin signs) after evaluation by two physicians and all of them lacked laboratory evidence of egg sIgE-mediated allergy. The data of clinical parameters, including serum egg sIgG4,

and demographic features, including age, gender and body mass index (BMI), were collected from patient files. The assessment of vaccination allergy risk was modified from previous reports, which via local (including unusual pain, swelling, redness) or systemic (including new or worsened skin rashes, nausea, vertigo, headache, chest tightness, cardiopalmus, fever) reactogenicity events^[9-10]. These vaccination allergy risks were determined by telephone through a series of questionnaires about allergic reactions within 7 days of each vaccine dose. The symptom scale was self-assessed by the subjects. Based on describes of the subjects, recorders rated their responses to the inactivated SARS-CoV-2 vaccine as none, mild, moderate, severe, or life threatening by comparing the grade scale in the questionnaires followed the FDA Center for Biologics Evaluation and Research (CBER) guidelines on toxicity grading scales and recent researches^[9,11]. The details were as follows: swelling and red were classified as mild (<5.0 cm), moderate ($5.0-10.0$ cm), severe (>10.0 cm), life threatening (skin necrosis and exfoliation); new or worsened skin rash was classified as mild ($<10\%$ body surface area (BSA)), moderate ($10\%-30\%$ BSA), severe ($>30\%$ BSA), life threatening (involve all BSA); fever was classified as mild ($37.1-38.0$ °C), moderate ($38.1-39.0$ °C), severe ($39.1-40.0$ °C), life threatening (>40.0 °C); other events were classified as mild (do not affect daily activities), moderate (affect with daily activities), severe (restrict daily activity), life threatening (Need emergency care or hospitalization). The Ethics Commission of the Affiliated Hospital of Medical School approved the study.

2.2 Egg sIgG4 antibodies test

An egg sIgG4 antibodies test kit (Zheda Dixun Biological Gene Engineering Co., Ltd., Hangzhou, China) was used. Serum samples were collected from the subjects in $40\mu\text{L}$ volumes, and the test was performed per the kit's instruction manual. The results were interpreted using an automatic immunoblot instrument (Zheda Dixun Biological Gene Engineering

Co., Ltd., Hangzhou, China). An activity outcome >250 U·mL⁻¹ was defined as an egg sIgG4-positive result. Based on the positive results, the different egg sIgG4 concentrations were categorized as mild (250–500 U·mL⁻¹, including 500 U·mL⁻¹), moderate (500–1 000 U·mL⁻¹) and severe ($>1\,000$ U·mL⁻¹).

2.3 Statistical analysis

Statistical analysis was performed using IBM SPSS 22.0 (IBM Corp., Armonk, NY, USA) and GraphPad Prism 8.0 (GraphPad Software, San Diego, CA, USA). Continuous data are expressed as means±standard deviation. Categorical data are described as percentages. Unpaired *t*-tests were used to analyze normally distributed continuous variables; the Mann-Whitney U tests were applied when variables were non-normally distributed. The χ^2 tests or Fisher's exact tests were used to analyze categorical variables. Univariate and multivariate regression models were performed using binary logistic regression analysis to identify the associations between vaccine responses and the egg sIgG4 antibody. Covariates such as age, gender, BMI, and clinical diagnosis were used to adjust for confounding factors, with the results expressed as odds ratios (ORs) and 95% confidence intervals (CIs). A *P*

value <0.05 was considered statistically significant.

3 Results

3.1 Baseline clinical characteristics

We invited 216 patients, and 122 of them were enrolled, among which the egg sIgG4-positive rate was 76.2%. All 122 subjects received two-dose inactivated SARS-CoV-2 vaccines (Fig. 1). Table 1 shows the baseline demographic characteristics of subjects (82 females and 40 males). The average age was 30 ± 9.5 years (range 18–59 years). According to the categorized standard of egg intolerance, there were 26 subjects with mildly egg-sIgG4 positive, 18 subjects with moderately egg-sIgG4 positive and 49 subjects with severely egg-sIgG4 positive. Patients diagnosed with atopic dermatitis and contact dermatitis had different egg sIgG4-positive rates (10.3%vs.11.5%vs.11.1%vs.0%, $P=0.030$; 6.9%vs.30.8%vs.33.3%vs.36.7%, $P=0.035$).

3.2 Total allergic responses

We showed that 31 of 122 subjects (25.41%) reported at least one allergic reaction, including local or systemic events within 7 days after receiving the first vaccine dose, 17 of 122 subjects (13.93%) reported

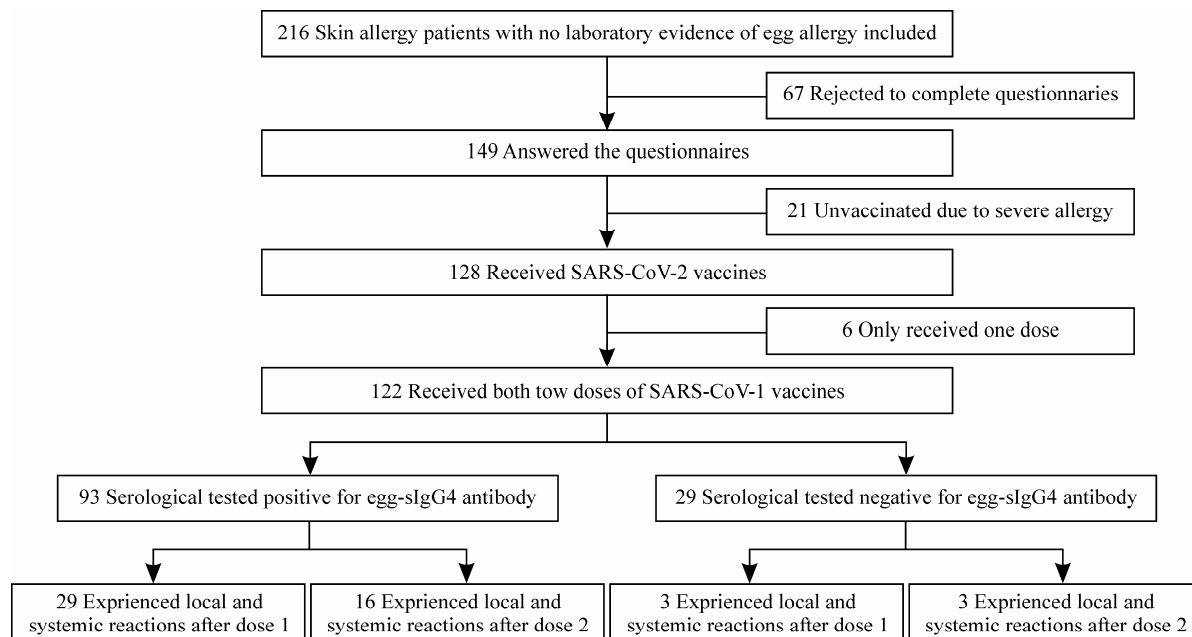


Fig. 1 Flowchart of the study protocol

Table 1 Baseline clinical characteristics of the studied patients

Characteristic		All subjects (n=96)	Serum egg sIgG4				P-value
			Negative (n=29)	Mildly positive (n=26)	Moderately positive (n=18)	Severely positive (n=49)	
Age (years), mean (SD)		30.7 (9.5)	33.4 (11.1)	33.4 (11.2)	29.7 (6.6)	28.0 (7.6)	0.092
Gender, no. (%)	Women	82 (67.2)	14 (48.3)	17 (65.4)	11 (61.1)	40 (81.6)	0.021 ²⁾
	Men	40 (32.7)	15 (51.7)	9 (34.6)	7 (38.9)	9 (18.4)	
Body mass index (BMI), mean (SD)		23.1 (4.8)	23.5 (3.8)	24.0 (6.3)	22.5 (3.6)	22.6 (4.8)	0.584
Clinical diagnosis, no. (%)	Urticaria ¹⁾	59 (48.3)	17 (58.6)	12 (46.2)	8 (44.4)	22 (44.9)	0.655
	Eczema	19 (15.5)	6 (20.7)	2 (7.7)	2 (11.1)	9 (18.4)	0.545
	Atopic dermatitis	8 (6.6)	3 (10.3)	3 (11.5)	2 (11.1)	0 (0)	0.030 ²⁾
	Contact dermatitis	34 (27.9)	2 (6.9)	8 (30.8)	6 (33.3)	18 (36.7)	0.035 ²⁾
	Drug eruption	2 (1.6)	1 (3.4)	1 (3.8)	0 (0)	0 (0)	0.369

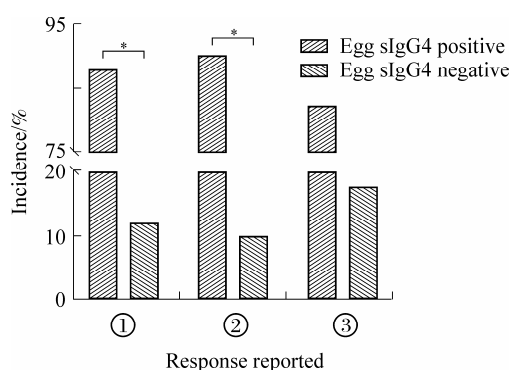
Note: 1) Included acute generalized urticaria and chronic spontaneous urticaria; 2) Statistical differences.

experiencing these events after receiving the second dose, and 6 of 122 subjects (4.92%) reported experiencing these events after both doses. Egg sIgG4-positive participants reported more allergic reactions after receiving either dose of the inactivated SARS-CoV-2 vaccine (39.78%vs.17.24%, $P=0.026$). Additionally, egg sIgG4-positive participants had more allergic reactions than did egg sIgG4-negative participants regardless of whether it was after the first or second dose, although only the former was statistically significant (30.1%vs.10.34%, $P=0.033$ for first dose; 15.15%vs.10.34%, $P=0.76$ for second dose; Fig. 2). All

allergic responses were mild and no subjects experienced severe events or were hospitalized.

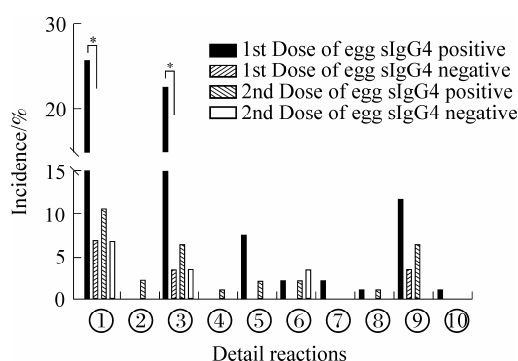
3.3 Local and systemic events

The most commonly reported local reaction to the first injection was unusual pain at the injection site (25.81%), followed by swelling and redness. A new or worsened skin rash was the most general systemic reaction to the first injection (22.58%), ranked before nausea, vertigo, headache, chest tightness, cardiopalmus and fever. The reported allergic reactions to the second injection yielded the same results, including both local and systemic events (10.75% for unusual pain, 6.45%



- ① Response reported following either injection;
 ② Response reported following 1st injection;
 ③ Response reported following 2nd injection; *: $P<0.05$.

Fig. 2 Incidence of allergic reactions in subjects with different reactions to egg



- ① Pain; ② Swelling; ③ New or worsened skin rash;
 ④ Nausea; ⑤ Vertigo; ⑥ Headache; ⑦ Chest tightness;
 ⑧ Cardiopalmus; ⑨ Fatigue; ⑩ Fever; *: $P<0.05$.

Fig. 3 Incidence of detailed reactions in subjects with different reactions to egg

for new or worsened skin rash). After the first injection, the incidence of unusual pain at the injection site was significantly higher in egg sIgG4-positive subjects than in egg sIgG4-negative subjects (25.81%vs.6.90%, $P=0.03$). Similarly, the incidence of new or worsened skin rashes was higher in egg sIgG4-positive subjects than

those with egg sIgG4-negative after the first injection (22.58%vs.3.45%, $P=0.019$; Fig. 3).

3.4 Correlations between egg-intolerance and allergic responses

Logistic regression analysis was used to search out the independent connections between egg sIgG4 and

Table 2 Independent associations between egg sIgG4 and allergic responses for patients with skin allergies within 7 days after receiving inactivated SARS-CoV-2 vaccines

Response	Serum egg sIgG4, No. (%)		Univariate regression		Multivariate regression ¹⁾	
	Positive ($n=93$)	Negative ($n=29$)	P -value	OR (95%CI)	P -value	OR (95%CI)
Neither dose 1 nor dose 2	56 (60.22)	24 (82.76)	0.031	0.315 (0.11–0.9)	0.032	0.286 (0.091–0.9)
Dose 1 No reaction	65 (69.9)	26 (89.7)	0.043	0.268 (0.075–0.958)	0.064	0.286 (0.076–1.078)
Unusual pain ²⁾	24 (25.81)	2 (6.90)	0.030	4.696 (1.038–21.246)	0.044	5.061 (1.047–24.457)
New or worsened skin rash	21 (22.58)	1 (3.45)	0.019	8.167 (1.048–63.630)	0.041	9.109 (1.098–75.563)
Fatigue	11 (11.83)	1 (3.45)	0.186	3.756 (0.464–30.416)	0.249	3.658 (0.404–33.136)
Swelling	0 (0)	0 (0)	–	–	–	–
Nausea	0 (0)	0 (0)	–	–	–	–
Vertigo	7 (7.53)	0 (0)	–	–	–	–
Headache	2 (2.15)	0 (0)	–	–	–	–
Chest tightness	2 (2.15)	0 (0)	–	–	–	–
Cardiopalmus	1 (1.08)	0 (0)	–	–	–	–
Fever	1 (1.08)	0 (0)	–	–	–	–
Dose 2 No reaction	79 (84.90)	26 (89.70)	0.525	0.651 (1.173–2.446)	0.440	0.566 (0.134–2.397)
Unusual pain ²⁾	10 (10.75)	2 (6.90)	0.543	1.627 (0.335–7.889)	0.761	1.313 (0.226–7.614)
New or worsened skin rash	6 (6.45)	1 (3.45)	0.544	1.931 (0.223–16.734)	0.361	2.893 (0.297–28.192)
Headache	2 (2.15)	1 (3.45)	0.694	0.615 (0.054–7.043)	0.601	0.479 (0.028–8.121)
Fatigue	6 (6.45)	0 (0)	–	–	–	–
Swelling	2 (2.15)	0 (0)	–	–	–	–
Nausea	1 (1.08)	0 (0)	–	–	–	–
Vertigo	2 (2.15)	0 (0)	–	–	–	–
Chest tightness	0 (0)	0 (0)	–	–	–	–
Cardiopalmus	1 (1.08)	0 (0)	–	–	–	–
Fever	0 (0)	0 (0)	–	–	–	–

Note: 1) Adjusted for confounding factors (age, gender, BMI, clinical diagnosis); 2) Pain was specified at the injection site compared with other vaccine types.

allergic responses following inactivated SARS-CoV-2 vaccines in patients with skin allergies. Egg sIgG4-negativity was related to a decreased risk of allergic responses after receiving the vaccine ($P=0.031$; OR: 0.315; 95%CI: 0.11–0.90). Adjusting for potential confounding factors did not alter the association ($P=0.032$; adjusted OR (aOR): 0.286; 95%CI: 0.091–0.900). In multivariate regression models, egg sIgG4-positivity was associated with a higher risk of unusual pain at the injection site for local reactions ($P=0.044$; aOR: 5.061; 95%CI: 1.047–24.457) and new or worsened skin rashes for systemic reactions ($P=0.041$; aOR: 9.109; 95%CI: 1.098–75.563) with the first injection (Table 2).

Considering egg sIgG4-negative as the reference, the ORs (95%CI) of mildly positive, moderately positive and severely positive in all responses reported following either injection were 2.133 (0.597–7.624), 2.400 (0.061–9.486), and 4.246 (1.392–12.948), respectively. The higher egg sIgG4 titer could enhance the risk of allergic responses after receiving the vaccine either the first or second dose (P for trend=0.008). In the responses reported following the first injection, for the same categories, the ORs (95%CI) were 3.193 (0.730–13.974), 1.733 (0.310–9.698), and 5.031 (1.333–19.003), respectively. The high egg sIgG4 titer was associated with a higher risk of allergic responses after receiving the first dose (P for trend=0.021). In the responses reported following the second injection, again for the same categories, the ORs (95%CI) were 0.374 (0.034–3.559), 2.476 (0.484–12.662), and 1.950 (0.482–7.883), respectively. There was no significant relationship between the titer of egg sIgG4 and allergic responses after receiving the second dose (P for trend=0.166) (Table 3).

4 Discussion

With large-scale SARS-CoV-2 vaccinations, the safety of persons with histories of allergies has attracted much attention. Specialists have stated that individuals

Table 3 Stratified analyses of associations between serum concentrations of egg sIgG4 and allergic responses for patients with skin allergies within 7 days after receiving inactivated SARS-CoV-2 vaccines

Stratified concentrations ¹⁾ of egg sIgG4	Response reported following either injection		
	P -value	OR (95%CI)	P for trend
Negative	Referent	Referent	Referent
Mildly positive	0.244	2.133 (0.597–7.624)	0.008 ²⁾
Moderately positive	0.213	2.400 (0.061–9.486)	0.008 ²⁾
Severely positive	0.011	4.246 (1.392–12.948)	0.008 ²⁾
Stratified concentrations ¹⁾ of egg sIgG4	Response reported following 1st injection		
	P -value	OR (95%CI)	P for trend
Negative	Referent	Referent	Referent
Mildly positive	0.0123	3.193 (0.730–13.974)	0.021 ²⁾
Moderately positive	0.531	1.733 (0.310–9.698)	0.021 ²⁾
Severely positive	0.017	5.031 (1.333–19.003)	0.021 ²⁾
Stratified concentrations ¹⁾ of egg sIgG4	Response reported following 2nd injection		
	P -value	OR (95%CI)	P for trend
Negative	Referent	Referent	Referent
Mildly positive	0.373	0.347 (0.034–3.559)	0.166
Moderately positive	0.276	2.476 (0.484–12.662)	0.166
Severely positive	0.349	1.950 (0.482–7.883)	0.166

Note: 1) Serum concentrations of egg sIgG4 is grouped into negative (<250 U·mL⁻¹), mild (250–500 U·mL⁻¹, including 500 U·mL⁻¹), moderate (500–1 000 U·mL⁻¹) and severe (>1 000 U·mL⁻¹); 2) Statistical differences.

with suspected allergies should be assessed by an allergist before receiving the SARS-CoV-2 vaccination^[12]. Li et al^[13] conducted a large prospective study of 52 998

health care employees in the US to affirm the overall safety of the SARS-CoV-2 vaccine and found that a self-reported allergic history was correlated with a higher risk for allergic reactions within 3 days after receiving the vaccine (OR: 2.46; 95%CI: 1.92–3.16). Magen et al^[14] retrospectively studied participants from Israel with relapsed chronic spontaneous urticaria (CSU) and onset CSU within 3 months of receiving the Pfizer-BioNTech SARS-CoV-2 vaccine, none of them reported an IgE-mediated hypersensitivity reaction after receiving the vaccination; however, the rate of relapsing CSU in this study was positively associated with concomitant allergic diseases such as allergic rhinitis, asthma and atopic dermatitis (OR: 6.13; 95%CI: 2.52–14.89). Rojas-Pérez-Ezquerro et al^[15] prospectively evaluated whether patients with previous severe allergic diseases could tolerate vaccines. They found that 99.2% of participants received the SARS-CoV-2 vaccine with no adverse events.

The exiting studies have shown that allergic patients with adverse events after vaccines had variable probabilities of adverse reactions to food, possibly owing to lack of a target food in this group^[16–18]. Our study was the first to evaluate the safety of inactivated SARS-CoV-2 vaccines in egg-intolerant patients with skin allergies but lacking laboratory evidence of egg allergy. None of the 122 participants had a serious allergic response. Fewer than half of the subjects presented limited and mild local and systemic reactions in the first week after receiving the vaccine. We considered egg sIgG4-positive participants to be egg-intolerant and categorized them as mild (250–500 U·mL⁻¹, including 500 U·mL⁻¹), moderate (500–1 000 U·mL⁻¹) and severe (>1 000 U·mL⁻¹). Although egg sIgG is also present in the healthy group, the antibody titers are typically only mildly to moderately elevated, which was lower than those of egg sIgGs linked to clinical allergy reactions^[8,19–20]. In our study, egg sIgG4 serum concentration is positively associated with adverse events after vaccines. Consistent with the findings of

Shavit et al^[21], the most common of these reactions were unusual pain at the injection site and new or worsened skin rashes, and egg-intolerant patients with skin allergies had a nearly 3-fold increased risk of these responses. The appearance of skin rashes is a newly reported adverse effect of the SAR-CoV-2 vaccine, which was more pronounced in patients with skin allergies in our study^[22]. Besides, these cutaneous reactions were either self-limited or alleviated with antihistamines. Our subjects often experienced recurrence of the original skin rash, and egg intolerance increased the probability of recurrence by nearly 9-fold. We also found that most allergic reactions to the inactivated SARS-CoV-2 vaccine were more likely to occur after the first injection. However, these subjects often experienced different events after the second dose, and some even had no adverse reactions. Other reports reached similar conclusions^[18,23].

Allergic events to vaccines are generally caused by excipients in the vaccine rather than the active ingredient^[24]. Some vaccines, such as influenza vaccines, require egg products to maintain viral growth and thus contain residual amounts of egg protein^[25]. Consequently, numerous studies have evaluated the safety of egg-based influenza vaccines in patients who experienced serious reactions to eggs and indicated that the recipients did not face an increased risk of other allergic reactions^[26–27]. Current guidelines have been changed from “egg allergy is a contraindication to the flu vaccination” to “egg allergy does not increase the risk of adverse reactions to egg-based influenza vaccines”^[28]. Unlike egg-based flu vaccines, we evaluated the inactivated vaccines Corona Vac and BBIBO-CorV, which use formalin with alum or aluminum hydroxide as adjuvants^[29]. The reasons of our egg-intolerant participants that were more likely to have allergic reactions may be associated with the small amount of protein during production, which was not listed as an active ingredient^[17]. But this is speculative, and the mechanisms of action of allergic reactions after

vaccinations are uncertain. Allergic responses to vaccines are divided into acute and delayed onset. Acute-onset reactions are mediated by IgE antibodies, while delayed-onset reactions are mediated by IgM or IgG antibodies^[30]. In these antibody-mediated anaphylactic reactions, tryptase is released from mast cells, which can lead to anaphylaxis^[31]. The tryptase baseline of our egg-intolerant participants may have been higher than that of the other participants. However, no evidence exists to support this, and anaphylaxis can occur when tryptase levels remain normal^[29]. Kanduc et al^[32] considered that cross-reactions between vaccine elements and molecules in humans could lead to the development of autoimmunity, which is a potential cause for the higher risk of allergic reactions in our egg-intolerant participants following vaccination. The new foreign antigen elicits an antibody and T-cell-driven response, which becomes a trigger for post-vaccine allergic reactions^[33].

In summary, our study was the first to stratify the allergic patients lacking laboratory evidence of egg allergy with and without egg intolerance to aid in redefining SARS-CoV-2 vaccine recipients. One limitation of our study is that the sample size was not very large, which led to sample deviation. Another limitation is that we used SARS-CoV-2 vaccines from only two suppliers; thus, we cannot conclude that vaccines from other suppliers will have the same conclusions. Meanwhile, patients with egg intolerance commonly experience gastrointestinal symptoms including abdominal cramps, diarrhea, and constipation, which was ignored in our questionnaires. Finally, owing to our retrospective design, the data are based on participants' memory and thus may be biased and the information gathered by the investigators could have been biased towards more severe reactions, some immunization stress-related responses may have gone unrecognized. Consequently, further investigations are warranted to identify the safety of SARS-CoV-2 vaccines in larger samples of patients with adverse

reactions to eggs or other foods.

5 Conclusion

Similar to other industry reports, we found that inactivated SARS-CoV-2 vaccines were generally safe, and severe adverse responses were rare. Egg intolerance increased the risk of allergic reactions following vaccinations in adults with skin allergies, and the reactions were more frequent after the first dose, which was positively associated with egg serum concentration. The commonly reported reactions within 7 days post-injection were unusual pain at the injection site and new or worsened skin rashes. Our study contributed to assessing the impact of vaccines on egg-intolerant adults.

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伴有鸡蛋不耐受的皮肤过敏症患者接种灭活 SARS-CoV-2 疫苗的安全性调查

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摘要: 为明确灭活新型冠状病毒疫苗在伴有鸡蛋不耐受皮肤过敏症患者中的安全性, 该回顾性研究纳入缺乏鸡蛋过敏实验证据但鸡蛋不耐受的皮肤过敏症成年患者。通过电话随访记录每次接种疫苗后 7 天的不良反应, 研究共纳入 122 名受试者(平均年龄 (30 ± 9.47) 岁)。和鸡蛋耐受的受试者相比, 鸡蛋不耐受者在接种疫苗后会出现更多的不良反应(39.78%/17.24%, $P < 0.05$)。同时, 特异性鸡蛋不耐受抗体的滴度与接种疫苗后不良反应的风险成正比(趋势 $P = 0.008$)。其中, 注射部位异常疼痛和新发或原有皮疹恶化为最常见的不良反应, 且在第一针剂后出现的概率更高。多元回归分析调整后发现, 鸡蛋不耐受会增加注射部位异常疼痛($P = 0.044$, aOR: 5.061, 95%CI: 1.047~24.457)及新发或原有皮疹恶化($P = 0.041$, aOR: 9.109, 95%CI: 1.098~75.563)的风险。结果表明: 灭活新型冠状病毒肺炎疫苗的总体安全性较高, 但鸡蛋不耐受会增加皮肤过敏患者接受疫苗后出现不良反应的风险, 并且与特异性鸡蛋不耐受抗体的血清浓度成正比。

关键词: 鸡蛋不耐受; 严重急性呼吸综合征冠状病毒 2; 皮肤过敏; 疫苗; 不良反应

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