Association between the FEV1 and the history of having lived at high altitude, with regard to a cross-sectional study in patients with COPD due to tobacco consumption, in Lima and Callao.

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Abstract

Objective: to determine the association between the history of having lived at high altitude and the values of forced expiratory volume in the 1st second (FEV1) ≥80%, in patients diagnosed with chronic obstructive pulmonary disease (COPD) due to tobacco consumption. **Methods:** a cross-sectional study that included the analysis of 196 patients with COPD confirmed by spirometry. The association was measured by calculating crude and adjusted odds ratios (OR), by logistic regression. **Results:** in the adjusted model, the history of having lived at high altitude showed an OR=1.50 (CI at 95%, 0.67 to 3.34, p=0.326) for the values of FEV1≥80%. **Conclusion:** no significant association was found between the history of having lived at high altitude and the values of FEV≥80% in patients with COPD.

Key words: Altitude. Chronic obstructive pulmonary disease. FEV1.Tobacco consumption.

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Introduction

Chronic obstructive pulmonary disease (COPD) is one of the entities whose prevalence is rapidly increasing throughout the world. It is characterized for becoming highly disabling, with high use of specialized health services[1,2].

Most studies on COPD and altitude have been made to determine the prevalence of this disease in high areas[3,4]; however, there is very little information about the effect of the history of having lived at high altitude, and even less in patients with COPD.

The aim of the study was to determine the association between the history of having lived at high altitude and values of FEV1≥80% in patients with COPD due to tobacco consumption.

Materials and methods

Secondary data analysis: the primary study was cross-sectional. Three medical centers from the city of Lima and one from Callao participated in it, during the years 2015 to 2017. It was aimed to describe the clinical characteristics of patients with COPD, who were being treated in specialized pneumology services. The 196 patients included in the primary study were asked their data, and the inclusion criteria were: **i.** Patients who gave their informed consent to participate in the study. **ii.** To have a diagnosis of COPD confirmed by spirometry, with values of FEV1/FVC <0.7 after use of B2 agonist. **iii.** To be 40 or more years old. **iv.** To be smoker or former smoker with a history greater than or equal to 10 packs per year. **v.** Outpatients. Patients diagnosed with cystic fibrosis were not included, nor patients with entities that prevent from getting reliable information. The patients were enrolled according to the order of arrival to their outpatient visits. In the primary study, the data collection of each patient was made by using a card created for this study; spirometries were collected within the previous 12 months; each spirometry was reviewed and had to be accepted by a pulmonologist specialist in functional tests. The data collection was in charge of a coordinator for each center.

The variables included for this study were: gender, age, marital status (married or not), possible confusing variables, such as race (if native American predominates or not), history of having had exposure to biomass at any time, magnitude of tobacco consumption (packets/year), condition of current smoker or former-smoker, and, finally, history of having had tuberculosis or not. The independent variable was the history of having lived at high altitude (those who lived at least one year, at an altitude of 1000 m.a.s.l. or more were considered exposed); and, the dependent variable: FEV1≥80% or FEV1 <80%.

In the univariate analysis plan, the variables are shown in means and standard deviation for the quantitative variables and in percentages for the qualitative ones. For the bivariate analysis, the distributed frequencies were compared by using the Pearson's chi-squared test (X2). Statistical significance for all the cases and tests was established in p <0.05 for two tails. Logistic regression analysis was performed for the calculation of crude and adjusted odds ratios; for the final model, multiple logistic regression. The model was adjusted considering the demographic variables and the confounding variables that had a value of p <0.100. Statistical package STATA 14, Statistics Data Analysis, StataCorp, College Station, Texas, USA was used.

The primary study was approved by the Human Research Ethics Committee of the Universidad Peruana Cayetano Heredia.

Results

The analysis was performed in the 196 patients. The sociodemographic and clinical characteristics are shown in Table 1. Table 2 shows bivariate analysis; sociodemographic variables and possible confusing variables are analyzed. A complementary analysis was carried out, dividing the sample into two groups according to the magnitude of tobacco consumption in packs / year (more or less than 30), and the proportion of patients with FEV1≥80% was calculated in groups exposed to altitude: (a) those

who have lived at high altitude at any time in their lives; and, (b) those who have lived at high altitude in the first 5 years of their lives (see Figure 1). Table 3 shows the logistic regression analysis and crude and adjusted odds ratios (OR).

Table 1. Patient characteristics (n=196).

Characteristics	N (%)
Gender	
Female	51 (26.0)
Male	145 (74.0)
Age in years*	68.6 ± 9.8
Age	
≥ 70 years	97 (49.5)
< 70 years	99 (50.5)
Marital status	
Married	120 (61.2)
Not married	76 (38.8)
Altitude. having lived in (history) †	
Exposed	38 (19.4)
Not exposed	158 (80.6)
Race	
Predominant Native American	59 (30.1)
Other	137 (69.9)
Biomass (history)	
Exposed	47 (24.0)
Not exposed	149 (76.0)
Packs year (cigarette)	36.1 (25.4)
Number of packs year	
≥ 30	103 (52.6)
< 30	93 (47.4)
Smoker's status	
Current smoker	48 (24.5)
Former smoker	148 (75.5)
Tuberculosis (history)	
Exposed	46 (23.5)
Not exposed	150 (76.5)
FEV1	
FEV1 ≥ 80% (GOLD1)	61 (31.1)
FEV1 < 80%	135 (68.9)

* Mean ± standard deviation

† History of having lived at high altitude, for one year or more and over 1000 m.a.s.l.

Tabla 2. Bivariate analysis between categories of FEV1≥80% (GOLD1) and other variables.

Characteristics	FEV1		p-value
	FEV1 ≥ 80%	FEFV < 80%	
Gender			
Female (n=51)	12	39	0.193
Male (n=145)	49	96	
Age			
≥ 70 years (n=97)	28	69	0.499
< 70 years (n=99)	33	66	
Marital status			
Married (n=120)	39	81	0.601
Not married (n=76)	22	54	
Race			
Predominant Native American (n=59)	18	41	0.903
Other (n=137)	43	94	
Packs/year			
≥ 30 (n=103)	26	77	0.061
< 30 (n=93)	35	58	
Smoker's status			
Current smoker (n=48)	14	34	0.736
Former smoker (n=148)	47	101	
Tuberculosis (history)			
Exposed (n=46)	16	30	0.540
Not exposed (n=150)	45	105	
Biomass (history)			
Exposed (n=47)	21	26	0.021
Not exposed (n=149)	40	109	
Altitude. having lived in (history)			
Exposed (n=38)	17	21	0.043
Not exposed (n=158)	44	114	

For the statistical calculation, Pearson's chi squared test (X2) was used.

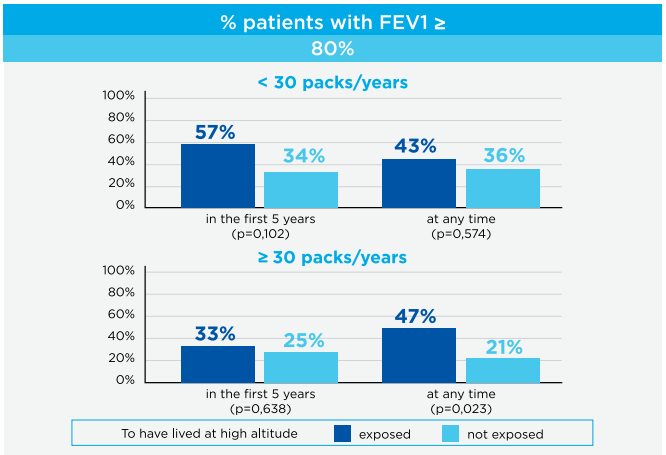

Figure 1. Percentages of patients with values of FEV1≥80% (GOLD1) in patients with COPD due to smoking. Comparisons among groups that have lived at high altitude with those who have never done so. The Pearson Chi Squared test (X2) was used.

Table 3. Logistic regression to determine association with the scores of FEV1 ≥80 (GOLD1) and the history of having lived at high altitude.

Variables	Crude Model			Adjusted Model*		
	Odds Ratio	IC 95%	p	Odds Ratio	IC 95%	p
Gender			0,176			-
Male	Ref.					
Female	0.60	(0.29 a 1.25)		-	-	
Marital status			0.601			-
Not married	Ref.					
Married	1.18	(0.63 a 2.21)		-	-	
Race			0.903			-
Others	Ref.					
Native American	0.96	(0.49 a 1.86)		-	-	
Packs year			0.063			0.031
< 30	Ref.					
≥ 30	0.56	(0.31 a 1.03)		0.48	(0.25 a 0.94)	
Biomass			0.023			0.041
Not exposed	Ref.					
Exposed	2.20	(1.12 a 4.24)		2.23	(1.03 a 4.83)	
Altitude			0.046			0.326
Not exposed	Ref.					
Exposed	2.10	(1.01 a 4.34)		1.50	(0.67 a 3.34)	

*Model adjusted by gender, marital status, race, packages / year, biomass and altitude.

Discussion

No significant association was found between patients with FEV ≥80% and history of having lived at high altitude and who had COPD due to tobacco consumption. Incidentally, the association between better values of FEV1 and the history of having been exposed to biomass smoke was found. Likewise, it was found that the number of packages / year is associated to lower values of FEV1 in patients with COPD, a widely studied and demonstrated factor[5,6].

Only a trend of higher percentage was found with better values of FEV1 in patients who have lived at high altitude. This trend was present in all the subgroups studied (see Figure 1). This is very likely related to adaptations occurred by exposure to high altitude[7,8]. The significant changes in people that descend to sea level[9] stand out, but this has not been studied in COPD.

The main limitation of this study was the size of the sample and the small number of patients with history of having lived at high altitude. We consider necessary a research whose objective is to study this history in particular, considering a larger sample size.

In conclusion, there were only trends of better values of percentage FEV1 in patients who have lived at high altitude, over 1000 m.a.s.l. and for more than one year at any time of their life; but not a statistically significant association. This first study should encourage us to continue doing much more researches on the subject.

Help or sources of finance
None.

Conflict of interest
The authors report no conflicts of interest regarding this manuscript.

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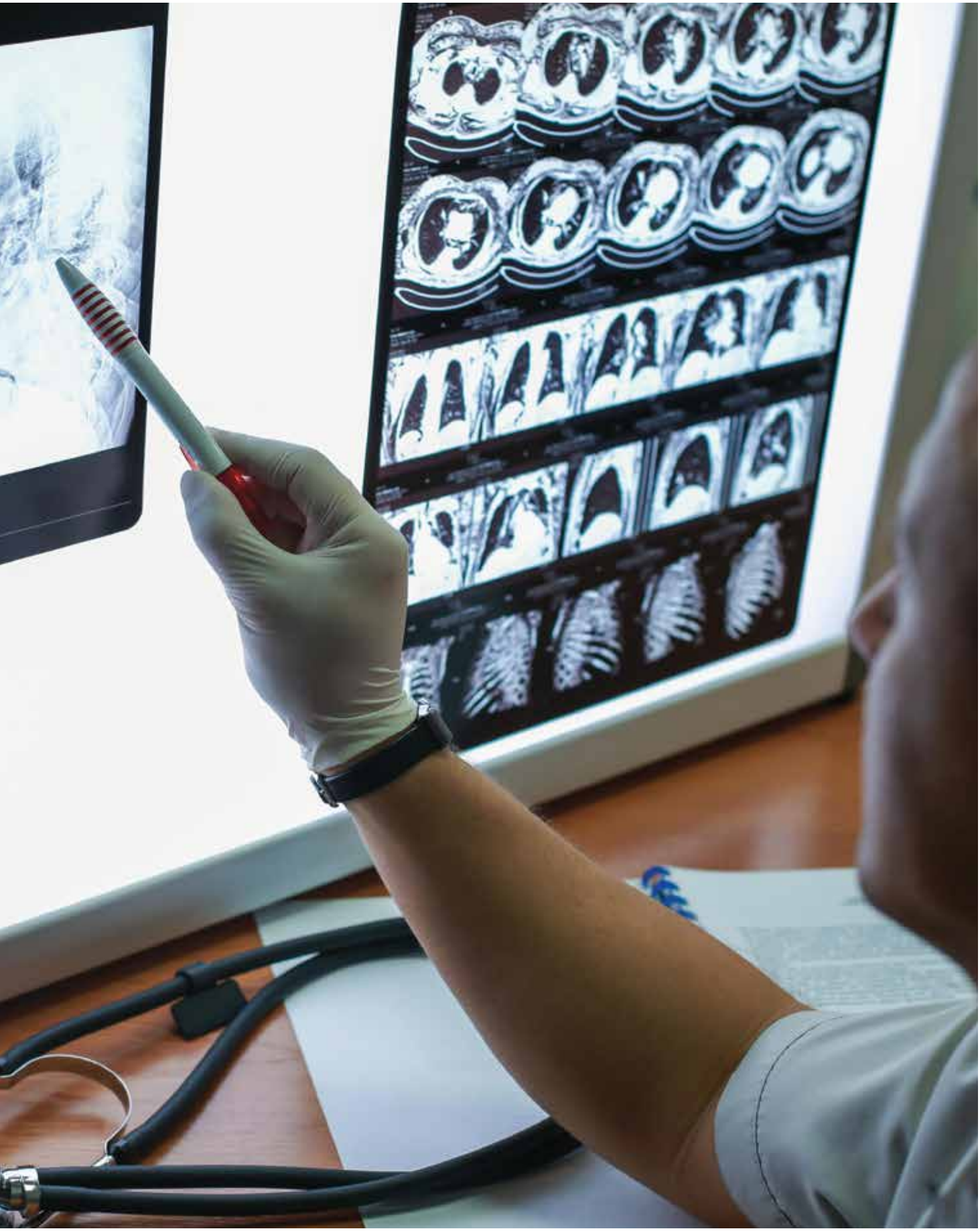

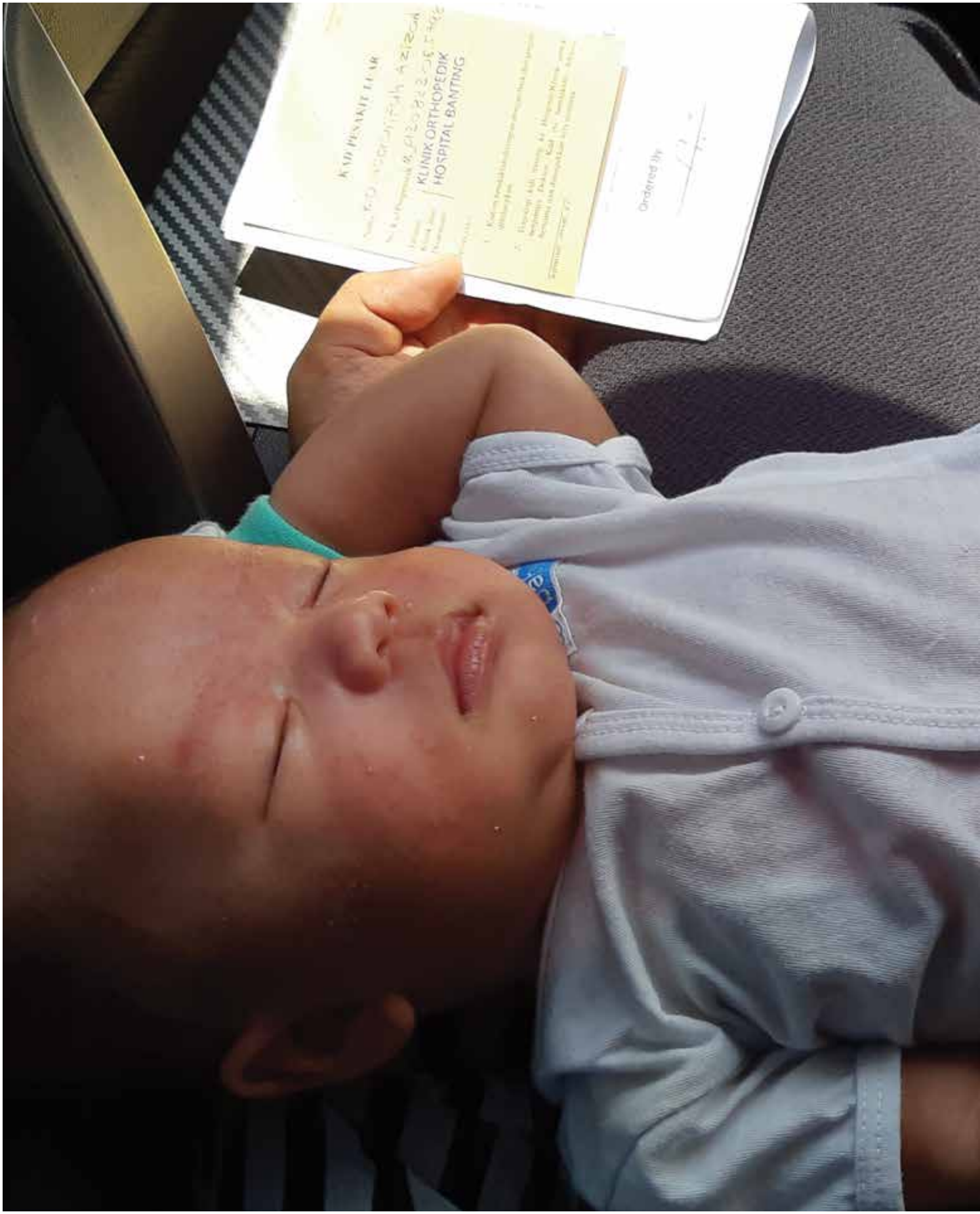
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