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Occupational skin diseases: a cross-sectional survey analysis

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ABSTRACT

Occupational skin diseases (OSDs) are among the most common occupational diseases worldwide, yet scientific data in Indonesia remain limited. This issue is important to study because workers across various sectors frequently encounter wet work, detergents, and chemical exposure. The present study aimed to assess individual and occupational risk factors associated with skin complaints/symptoms on the hands and forearms within the past 12 months and to test the feasibility of a simple prediction model in the Indonesian context. A cross-sectional study was conducted among 46 workers participating in health screening. Predictor variables included age, sex, type of occupation, length of employment, frequency of handwashing, shift work, and exposure status. Analysis was performed using Firth's logistic regression with reporting of odds ratios (OR), 95% confidence intervals (CI), and significance testing. Model performance was evaluated using the Hosmer–Lemeshow test, AUC/ROC, and Nagelkerke's pseudo-R^2. The prevalence of skin complaints reached 56.5%. Female workers had a 17-fold higher risk compared to males (OR = 17.20; 95% CI: 1.79–164.77; p = 0.014). The prediction model demonstrated good performance (AUC = 0.90; Hosmer–Lemeshow p = 0.307; Nagelkerke R^2 = 0.60). Female sex was identified as an important determinant of OSD in this population. The simple prediction model proved feasible for risk screening and could serve as a basis for prevention programs focusing on exposure control in Indonesia. Further studies with larger samples are needed to strengthen evidence across occupational categories.

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1. INTRODUCTION

Occupational skin diseases (OSDs), particularly contact dermatitis, are among the most frequently reported occupational diseases and have a significant impact on workers' productivity [1]-[3]. Globally, OSDs account for 30–45% of all occupational diseases and rank second after musculoskeletal disorders as the leading cause of lost workdays [4], [5]. Epidemiological studies indicate that the annual incidence in Europe reaches 0.5–1 per 1,000 workers, yet the true figure is believed to be much higher due to underreporting, which may be 10–50 times greater.

OSDs are among the most common work-related health issues worldwide and significantly contribute to morbidity across multiple industrial sectors [6], [7]. OSDs encompass conditions such as irritant contact dermatitis, allergic contact dermatitis, and skin infections caused by exposure to chemical, physical, or biological agents in the workplace [8], [9]. Irritant contact dermatitis accounts for approximately 80% of

all OSD cases globally, making it a major public health concern [10]. Long-term exposure to industrial agents such as solvents, detergents, and heavy metals constitutes a key risk factor among manufacturing and healthcare workers [11].

The economic burden of OSDs is also substantial, as it reduces productivity, increases absenteeism, and raises healthcare costs [12]. European studies estimate that approximately 15–20% of workers experience work-related skin symptoms annually. Healthcare, metal, and construction industries show the highest prevalence, particularly among workers frequently washing hands or handling harsh chemicals [13]. Moreover, individual factors such as genetic predisposition, age, and pre-existing skin conditions contribute to susceptibility to OSDs [14].

Global changes in labor patterns, including the expansion of the informal workforce and chemical industries, have intensified exposure risks to occupational skin hazards [15]. The COVID-19 pandemic further exacerbated the incidence of hand dermatitis due to increased use of disinfectants and prolonged glove wearing [16]. Repeated exposure to irritants without adequate protection can cause chronic skin damage, secondary infections, and diminished quality of life among workers [17].

The main determinants of OSDs have been mapped in several meta-analyses. The strongest risk factors are wet work (exposure to wet conditions) and an atopic history (e.g., atopic dermatitis or prior allergies) [18]. Exposure to detergents, disinfectants, solvents, and metals also increases risk, particularly when accompanied by high handwashing frequency, as commonly observed in healthcare and manufacturing sectors [18], [19]. In addition, workers with frequent handwashing burdens or limited access to skin protection (barrier creams, emollients) are more likely to experience accelerated impairment of skin barrier function [20], [21].

The Indonesian context presents unique challenges. Variations in types of work, differences in compliance with personal protective equipment use, and uneven implementation of occupational exposure control systems lead to inconsistent OSD risks across sectors [22], [23]. Several local studies, for instance among batik workers and healthcare personnel, have reported high prevalence of hand dermatitis directly linked to chemical exposure and intensive hygiene practices [24], [25]. This situation highlights the need to map OSD risk factors using analytical methods capable of assessing multiple determinants simultaneously.

Although previous studies have described the determinants of occupational skin diseases, the existing literature tends to present these findings in a descriptive manner, and synthesis across occupational categories remains limited. Despite repeated documentation of OSD prevalence in certain Indonesian sectors—such as batik production and healthcare—there is still no integrated understanding of how individual and workplace factors jointly predict OSD risk at the population level. Importantly, the gap in the literature lies in the absence of locally validated prediction models that could support early identification of at-risk workers. To date, most analytical or predictive frameworks originate from Europe or East Asia, and Indonesia lacks context-specific models that consider its unique work practices, hygiene behaviors, and exposure environments.

The present study addresses this gap by evaluating a simple, data-driven prediction model tailored to Indonesian workers, offering an initial step toward developing risk-screening tools that can be embedded within occupational health programs. This constitutes a key contribution, as the study not only examines conventional risk factors but also demonstrates the feasibility of applying bias-reduced logistic regression for modeling OSD risk in small or heterogeneous workforces—an approach rarely used in Indonesian occupational health research. Strengthening predictive capacity is highly significant for policy and prevention because OSDs contribute substantially to productivity loss, absenteeism, and compensation claims. A validated predictive approach may help employers and policymakers prioritize exposure control, improve workplace hygiene standards, and incorporate routine dermatitis surveillance into national occupational health strategies. Based on this gap, the present study aims to estimate individual and occupational risk factors for OSD among Indonesian workers undergoing health screening and to evaluate the performance of a simple prediction model that can serve as a foundation for preventive interventions.

2. METHOD

2.1. Study design and setting

This study employed a cross-sectional survey design to investigate the prevalence and determinants of occupational skin diseases among workers in Indonesia. Data were collected during a routine institutional health screening program, allowing researchers to capture information on dermatological symptoms, workplace exposures, and preventive practices. The analysis provided insights into associations between demographic factors, occupational risks, and reported skin conditions, contributing to evidence-based recommendations for workplace health interventions.

2.2. Population and sample

All workers attending the health screening during the study period were invited to participate. Inclusion criteria were workers aged ≥18 years, actively employed, willing to complete the survey, and providing complete responses to the questionnaire. Respondents with incomplete data on key variables were excluded from the analysis. The final analytic sample consisted of 46 participants.

2.3. Instruments and measurements

Data were collected using a structured questionnaire covering demographic characteristics, work history, occupational exposures, and hygiene practices. The instrument was adapted from the Nordic Occupational Skin Questionnaire (NOSQ-2002, Indonesian version), which has been previously applied in similar studies.

2.4. Study variables

The study variables consisted of the following: i) Primary outcome: self-reported skin complaints or symptoms (mainly on the hands, wrists, and forearms) within the past 12 months, coded as y = 1 if present and y = 0 if absent; and ii) Predictors: age group (<30, 30–39, 40–49, ≥50 years), sex, type of occupation (office, indoor, outdoor, public service, student, other), length of employment (<1 year, 1–3 years, >3 years), frequency of handwashing per day (0–5, 6–10, 11–20, >20 times), shift work status (yes/no), and occupational exposure status (exposed/not exposed).

2.5. Statistical analysis

Analyses were performed using Firth's bias-reduced logistic regression to address potential bias due to small sample size and sparse data in some predictor categories. Reference categories were set as: age 30–39 years, male, office work, 1–3 years of employment, handwashing 0–5 times per day, non-shift work, and exposed status. Results were reported as odds ratios (OR) with 95% confidence intervals (95% CI) and p-values.

2.6. Model feasibility

Model performance was assessed through the Hosmer–Lemeshow (HL) goodness-of-fit test for calibration, the area under the receiver operating characteristic curve (AUC) for discrimination, and Nagelkerke's pseudo-R^2 for explanatory power. Multicollinearity was evaluated using the variance inflation factor (VIF) on dummy variables (drop-first); VIF values <5 were considered acceptable. Occupational exposure status was assessed using a structured set of items adapted from the NOSQ-2002 (Indonesian version), which includes standardized questions on wet work, detergent use, chemical handling, glove use, and work tasks involving potential irritants or allergens. Exposure was coded as exposed when respondents reported at least one of the following within their routine tasks: i) ≥2 hours/day of wet work; ii) direct contact with detergents, disinfectants, solvents, oils, or other chemical agents; or iii) frequent handwashing exceeding task-based recommendations. To enhance measurement validity, exposure questions followed NOSQ-2002 definitions, which are widely used in epidemiological studies of occupational dermatitis. Internal consistency and content validity were ensured through expert review by an occupational physician and comparison with job descriptions obtained during the health screening session. Additionally, respondents were asked to cross-confirm their exposure by selecting specific tasks and materials they handle daily, minimizing misclassification due to self-reporting.

3. RESULTS AND DISCUSSION

3.1. Respondent characteristics

A total of 46 respondents were analyzed in this study. The prevalence of skin complaints or symptoms on the hands, wrists, or forearms within the past 12 months was 56.5%. By sex, respondents consisted of 20 females (43.5%) and 26 males (56.5%). Most respondents worked in the office sector (71.7%), followed by outdoor jobs (13.0%). Regarding handwashing frequency, 45.7% of respondents reported washing their hands 0–5 times per day, while 32.6% washed 6–10 times per day. Only 2 respondents (4.3%) worked in a shift system, while more than half (58.7%) reported occupational exposure.

3.2. Logistic regression analysis

As shown in Table 1, Firth's logistic regression analysis indicated that female sex was a significant predictor with an OR of 17.20 (95% CI: 1.79–164.77; p = 0.014). This suggests that women were 17 times more likely to experience skin complaints compared to men. Other variables, including age, occupation type, length of employment, handwashing frequency, shift status, and exposure status, did not reach statistical significance. Several occupational categories (e.g., student, indoor, and public service) yielded extreme OR estimates or not estimable (NE) results due to very small cell sizes. This finding is consistent with the limitations of the small sample size and uneven data distribution.

3.3. Model feasibility

The prediction model demonstrated excellent discriminatory performance with an AUC/ROC value of 0.90. The Hosmer–Lemeshow test yielded p = 0.307, indicating adequate model calibration. Nagelkerke's pseudo-R^2 was 0.60, suggesting that the model was able to explain approximately 60% of the outcome variation.

Table 1. Logistic regression (Firth bias-reduced): OR estimates, 95% CI, and p

Variables (dataset labels)	Coefficient (β)	OR (95% CI); p
Age group 40-49 years	0.780	2.18 (95% CI 0.14–33.23); p = 0.574
Age group <30 years	-0.856	0.42 (95% CI 0.03–5.45); p = 0.511
Age group ≥50 years	-2.170	0.11 (95% CI 0.01–1.73); p = 0.118
Female gender	2.845	17.20 (95% CI 1.79–164.77); p = 0.014
Other types of work	3.943	51.59 (95% CI 0.53–4993.89); p = 0.091
Types of field work	-0.162	0.85 (95% CI 0.02–32.46); p = 0.930
Types of student jobs	-125012533.127	0.00 (95% CI 0.00–0.00); p = <0.001
Types of community service jobs	687328859.086	NE (very rare category/empty cells)
Type of room work	-125000021.684	0.00 (95% CI 0.00–0.00); p = <0.001
How long is the working period? <1 year	-1.763	0.17 (95% CI 0.00–6.23); p = 0.336
How long is the working period? >3 years	-2.455	0.09 (95% CI 0.00–4.99); p = 0.236
How many times do you wash your hands in a typical work day? 11-20 times	0.556	1.74 (95% CI 0.11–26.59); p = 0.689
How many times do you wash your hands in a typical work day? 6-10 times	0.543	1.72 (95% CI 0.24–12.13); p = 0.586
How many times do you wash your hands in a typical workday? >20 times	-335184178.848	0.00 (95% CI 0.00–0.00); p = <0.001
Do you work in shift system? yes	41553305.964	NE (very rare category/empty cells)
Exposure status not exposed	-0.123	0.88 (95% CI 0.13–6.09); p = 0.901

3.4. Discussion

This study found that female sex was the main risk factor for the occurrence of OSDs. This finding is consistent with several meta-analyses showing that women are more susceptible to contact dermatitis due to greater exposure to wet work, detergent use, and household chores that may exacerbate skin barrier damage [18], [19]. Studies among healthcare workers have also demonstrated a higher prevalence of hand dermatitis in women, particularly during the COVID-19 pandemic when handwashing frequency increased drastically [20], [22].

Occupational factors in this study did not show significant associations, although some non-office categories indicated a trend toward increased risk. This imprecision is most likely due to the small sample size and unbalanced respondent distribution, for instance in the student or public service categories, which included only one or two individuals. The use of Firth's logistic regression was appropriate to reduce separation bias arising from sparse data, yet results from extreme categories should still be interpreted with caution. High handwashing frequency (>10 times/day) was not significantly associated in this study, which contrasts with consistent evidence in the literature identifying repeated handwashing as a major risk factor for hand dermatitis among healthcare and sanitation workers [23]. This discrepancy may be explained by the limited sample size and the reliance on self-reported exposure assessment.

A deeper interpretation of why female sex emerged as a significant predictor may be explained by a combination of biological susceptibility and occupational behavioral patterns. Several international studies report that women exhibit inherently higher skin sensitivity due to lower corneocyte cohesion, reduced natural moisturizing factor (NMF) levels, and greater transepidermal water loss, which collectively make the skin barrier more vulnerable to irritants and allergens [26], [27]. In addition, a number of global surveys highlight that woman tend to engage more frequently in wet work and domestic cleaning activities outside of work hours, contributing to cumulative irritant exposure; this "dual exposure burden" has been reported in studies from Germany, Korea, and the UK [28]-[30].

These patterns support the finding that female workers in this study had substantially higher odds of reporting skin symptoms despite being employed predominantly in office settings. The novelty of the present findings lies in demonstrating that gender-related susceptibility remains prominent even in a low-exposure occupational environment, suggesting that biological vulnerability may play a more dominant role than occupational category alone. This emphasizes the need for gender-sensitive interventions, such as targeted skin-barrier education for female employees, proactive emollient programs at workplaces, and routine dermatitis surveillance that accounts for sex-specific risk profiles.

Methodologically, the strength of this study lies in the application of Firth's logistic regression, which enabled all occupational categories to be retained in the model. However, key limitations include the

small sample size, potential recall bias, and the absence of objective measurements of chemical exposure or personal protective equipment use. The practical implications of this study highlight the need for gender-based preventive interventions, given that women are demonstrably at higher risk. Structured programs for skin hygiene education, regular use of emollients or barrier creams, and workplace exposure control should be prioritized. Furthermore, routine OSD screening could be integrated into occupational health programs, particularly in sectors with elevated risk.

4. CONCLUSION

This study demonstrated that female sex is a significant risk factor for OSDs in the worker population studied. The prediction model based on Firth's logistic regression showed good performance (AUC = 0.90), indicating its potential use as a simple screening tool in occupational health programs. These findings underscore the need for preventive interventions targeting female workers and units with high exposure risk, through exposure control, skin hygiene education, and routine use of emollients or barrier creams. To strengthen the evidence, future studies with larger sample sizes, standardized exposure measurements, and longitudinal designs are required to provide more precise risk estimates by occupational category and to support the formulation of national occupational health policies.

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Reza Yuridian Purwoko	✓	✓			✓	✓			✓					
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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICAL APPROVAL

All respondents provided informed consent and voluntarily participated in this study.

DATA AVAILABILITY

The data supporting this study are available and may be obtained by contacting the corresponding author.

REFERENCES

[1] D. Mijakoski, "Occupational skin diseases," in *Allergy and Immunotoxicology in Occupational Health - The Next Step*, 2020, pp. 129–149. doi: 10.1007/978-981-15-4735-5_9.
[2] C. Srinivas and M. Sethy, "Occupational dermatoses," *Indian Dermatology Online Journal*, vol. 14, no. 1, pp. 21–31, 2023, doi: 10.4103/idoj.idoj_332_22.
[3] K. Aalto-Korte, K. Koskela, and M. Pesonen, "Allergic contact dermatitis and other occupational skin diseases in health care workers in the finnish register of occupational diseases in 2005–2016," *Contact Dermatitis*, vol. 84, no. 4, pp. 217–223, 2021.
[4] T. L. Diepgen, "Occupational skin diseases," *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*, vol. 10, no. 5, pp. 297–315, May 2012, doi: 10.1111/j.1610-0387.2012.07890.x.

[5] O. Pickard, P. Burton, H. Yamada, B. Schram, E. F. D. Canetti, and R. Orr, "Musculoskeletal disorders associated with occupational driving: a systematic review spanning 2006–2021," *International Journal of Environmental Research and Public Health*, vol. 19, no. 11, p. 6837, Jun. 2022, doi: 10.3390/ijerph19116837.
[6] T. L. Diepgen, "Occupational skin-disease data in Europe," *International Archives of Occupational and Environmental Health*, vol. 76, no. 5, pp. 331–338, Jun. 2003, doi: 10.1007/s00420-002-0418-1.
[7] C. L. Higgins, A. M. Palmer, J. L. Cahill, and R. L. Nixon, "Occupational skin disease among Australian healthcare workers: a retrospective analysis from an occupational dermatology clinic, 1993–2014," *Contact Dermatitis*, vol. 75, no. 4, pp. 213–222, Oct. 2016, doi: 10.1111/cod.12616.
[8] B. D. Lushniak, "Occupational contact dermatitis," *Dermatologic Therapy*, vol. 17, no. 3, pp. 272–277, Sep. 2004, doi: 10.1111/j.1396-0296.2004.04032.x.
[9] K. Patel and R. Nixon, "Irritant contact dermatitis — a review," *Current Dermatology Reports*, vol. 11, no. 2, pp. 41–51, Apr. 2022, doi: 10.1007/s13671-021-00351-4.
[10] T. Rustemeyer, I. M. W. van Hoogstraten, B. M. E. von Blomberg, S. Gibbs, and R. J. Scheper, "Mechanisms of irritant and allergic contact dermatitis," in *Contact Dermatitis*, Berlin, Heidelberg: Springer Berlin Heidelberg, 2011, pp. 43–90.
[11] S. Semple, "Dermal exposure to chemicals in the workplace: just how important is skin absorption?," *Occupational and Environmental Medicine*, vol. 61, no. 4, pp. 376–382, Apr. 2004, doi: 10.1136/oem.2003.010645.
[12] R. Brans, "Epidemiology and burden of occupational skin diseases," in *Updates in Clinical Dermatology*, vol. Part F5712, 2023, pp. 13–21. doi: 10.1007/978-3-031-22727-1_2.
[13] Y. T. Yüksel *et al.*, "Prevalence and incidence of hand eczema in healthcare workers: A systematic review and meta-analysis," *Contact Dermatitis*, vol. 90, no. 4, pp. 331–342, 2024, doi: 10.1111/cod.14489.
[14] A. Thielitz and S. M. John, "Occupational contact dermatitis," in *Quick guide to contact dermatitis*, Springer, 2016.
[15] P. Kasemsarn, J. Bosco, and R. L. Nixon, "The role of the skin barrier in occupational skin diseases," in *Current Problems in Dermatology*, 2016, pp. 135–143. doi: 10.1159/000441589.
[16] S. Hadjieconomou, J. Hughes, and S. Kamath, "Occupational skin disease during the COVID-19 pandemic, as captured in a Dermatology staff clinic in the United Kingdom," *Journal of the European Academy of Dermatology and Venereology*, vol. 34, no. 11, pp. e670–e671, 2020, doi: 10.1111/jdv.16754.
[17] U. P. Charan, C. V. D. Peter, and S. A. Pulimood, "Impact of hand eczema severity on quality of life," *Indian Dermatology Online Journal*, vol. 4, no. 2, pp. 102–105, 2013, doi: 10.4103/2229-5178.110629.
[18] M. G. Schütte, S. J. Tamminga, G. J. de Groene, S. Kezic, and H. F. van der Molen, "Work-related and personal risk factors for occupational contact dermatitis: A systematic review of the literature with meta-analysis," *Contact Dermatitis*, vol. 88, no. 3, pp. 171–187, 2023, doi: 10.1111/cod.14253.
[19] F. B. Sedeh, T. E. Michaelsdóttir, G. B. E. Jemec, O. S. Mortensen, and K. S. Ibler, "Prevalence, risk factors, and prevention of occupational contact dermatitis among professional cleaners: a systematic review," *International Archives of Occupational and Environmental Health*, vol. 96, no. 3, pp. 345–354, 2023, doi: 10.1007/s00420-022-01937-6.
[20] G. Jacobsen, K. Rasmussen, A. Bregnhøj, M. Isaksson, T. L. Diepgen, and O. Carstensen, "Causes of irritant contact dermatitis after occupational skin exposure: a systematic review," *International Archives of Occupational and Environmental Health*, vol. 95, no. 1, pp. 35–65, 2022, doi: 10.1007/s00420-021-01781-0.
[21] A. Giménez-Arnau, "Standards for the protection of skin barrier function," *Current Problems in Dermatology (Switzerland)*, vol. 49, pp. 123–134, 2016, doi: 10.1159/000441588.
[22] J. Yu *et al.*, "Occupational dermatitis to facial personal protective equipment in health care workers: A systematic review," *Journal of the American Academy of Dermatology*, vol. 84, no. 2, pp. 486–494, 2021, doi: 10.1016/j.jaad.2020.09.074.
[23] N. Hamnerius, A. Pontén, O. Bergendorff, M. Bruze, J. Björk, and C. Svedman, "Skin exposures, hand eczema and facial skin disease in healthcare workers during the COVID-19 pandemic: A cross-sectional study," *Acta Dermato-Venereologica*, vol. 101, no. 9, 2021, doi: 10.2340/00015555-3904.
[24] S. A. Febriana *et al.*, "Hazard identification and the prevalence of occupational skin disease in Indonesian Batik workers," *Scientific Reports*, vol. 13, no. 1, 2023, doi: 10.1038/s41598-022-17890-w.
[25] P. M. Christopher, R. S. Roren, C. Tania, N. N. Jayadi, and C. Cucunawangsih, "Skin damage and quality of life among healthcare workers providing care during the COVID-19 pandemic: A multicenter survey in Banten Province, Indonesia," *Indian Journal of Dermatology*, vol. 67, no. 3, p. 313, 2022, doi: 10.4103/ijd.ijd_645_21.
[26] E. Proksch, J. M. Brandner, and J. M. Jensen, "The skin: An indispensable barrier," *Experimental Dermatology*, vol. 17, no. 12, pp. 1063–1072, 2008, doi: 10.1111/j.1600-0625.2008.00786.x.
[27] E. Tur, "Physiology of the skin—differences between women and men," *Clinics in Dermatology*, vol. 15, no. 1, pp. 5–16, Jan. 1997, doi: 10.1016/S0738-081X(96)00105-8.
[28] A. Eng, A. 'T Mannetje, D. McLean, L. Ellison-Loschmann, S. Cheng, and N. Pearc, "Gender differences in occupational exposure patterns," *Occupational and Environmental Medicine*, vol. 68, no. 12, pp. 888–894, 2011.
[29] W. Boonchai, S. Likittanasombat, N. Viriyaskultorn, and S. Kanokrungsee, "Gender differences in allergic contact dermatitis to common allergens," *Contact Dermatitis*, vol. 90, no. 5, pp. 458–465, 2024, doi: 10.1111/cod.14479.
[30] J. D. Meyer, Y. Chen, D. L. Holt, M. H. Beck, and N. M. Cherry, "Occupational contact dermatitis in the UK: A surveillance report from EPIDERM and OPRA," *Occupational Medicine*, vol. 50, no. 4, pp. 265–273, 2000, doi: 10.1093/occmed/50.4.265.

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