Knowledge, attitudes, and practices of retail pharmacy staff toward substandard and falsified dietary supplements in Northern Viet Nam, 2025

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Summary

Background: Substandard and falsified dietary supplements (SF-DS) pose significant public health risks, including treatment failure, toxicity, and loss of consumer confidence. Retail pharmacy staff play a key role as the final checkpoint before these products reach the public, yet evidence regarding their knowledge, attitudes, and practices (KAP) toward SF-DS in Viet Nam remains limited. *Objective:* To assess the knowledge, attitudes, and practices of retail pharmacy staff toward SF-DS and identify associated factors. *Subject and method:* A cross-sectional study was conducted among 385 retail pharmacy staff from six provinces/cities in Northern Viet Nam (Ha Noi, Hai Phong, Hung Yen, Bac Giang, Quang Ninh, and Lang Son) between January and May 2025. Data were collected using a structured questionnaire consisting of demographic characteristics, knowledge (10 items), attitudes (12 items), practices (5 items), and training needs. Descriptive statistics and binary logistic regression were performed using SPSS version 20.0, with statistical significance set at $p<0.05$. *Result:* Participants had moderately good knowledge (mean=3.8/5); 78.5% recognized that SF-DS may contain banned substances. Attitudes were generally positive (mean=4.1/5), though 53.3% feared legal liability when unintentionally selling SF-DS. Practice gaps were notable, particularly in reporting suspected cases (29.3%). Experience >10 years (OR=2.15), prior training (OR=1.89), and higher education (OR=1.67) were significantly associated with more positive attitudes. *Conclusion:* While pharmacy staff show strong ethical awareness and good knowledge, practical implementation remains limited. Strengthening continuing professional development, formalizing SOPs, and improving reporting/traceability systems are essential to enhance SF-DS control.

Keywords: Counterfeit products; Substandard and falsified dietary supplements (SF-DS); Knowledge; Attitudes; Practices; Retail pharmacy; Viet Nam.

I. BACKGROUND

Dietary supplements (DS), classified as a subgroup of functional foods, are increasingly popular in Viet Nam due to their perceived benefits in nutritional support, immune enhancement, and disease prevention[1]. According to the Ministry of Health, more than 10,000 DS products were registered nationwide by 2023, accounting for approximately 40% of the over-the-counter healthcare market[2]. However, alongside this rapid growth, the circulation of substandard and falsified dietary supplements (SF-DS) including those involving brand counterfeiting, mislabeling of ingredients, or adulteration with banned pharmaceutical substances such as sibutramine or sildenafil has emerged as a major public health challenge. SF-DS may cause serious adverse effects ranging from treatment failure to toxic reactions and even death[3].

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A study conducted in Can Tho (2022–2023) revealed that consumers often lack adequate knowledge and rely primarily on product advice from sales representatives, leading to unsafe self-use of DS[4]. Similarly, a 2024 study in Ho Chi Minh City on counterfeit medicines emphasized the critical role of community pharmacists in product verification and reporting, yet only 64.1% had received relevant training, reflecting limitations in professional preparedness and regulatory enforcement5. In Viet Nam, DS are regulated under the Law on Food Safety rather than the Law on Pharmacy, resulting in less stringent inspection and sanctions compared to pharmaceuticals. Existing penalties under Decree 15/2018/ND-CP (up to 400 million VND) remain insufficient as a deterrent, while unofficial estimates suggest that SF-DS account for 10 - 15% of the domestic market[6].

Retail pharmacy staff, especially those working in community pharmacies, serve as the final gatekeepers before health-related products reach consumers. Their ability to identify and respond to SF-DS is therefore essential in safeguarding public health. However, limited evidence exists regarding their knowledge, attitudes, and practices (KAP) toward SF-DS in Viet Nam. To date, no comprehensive study has assessed KAP regarding SF-DS among retail pharmacy staff in the Northern region. Understanding this issue is crucial to inform strategies for training, regulation, and monitoring of DS distribution.

Therefore, this study was conducted to evaluate the knowledge, attitudes, and practices of retail pharmacy staff toward SF-DS in Northern Viet Nam and to identify factors associated with their attitudes and practices. The findings are expected to provide scientific evidence for improving training programs, strengthening regulatory compliance, and enhancing professional responsibility within the retail pharmacy network.

II. SUBJECT AND METHOD

2.1. Study Design and Participants

A descriptive cross-sectional study was conducted among retail pharmacy staff working at community pharmacies and licensed drug retailers in six provinces and cities in Northern Viet Nam: Ha Noi, Hai Phong, Hung Yen, Bac Giang, Quang Ninh, and Lang Son. Eligible participants were individuals aged 18 years or older who were currently practicing at a retail pharmacy and voluntarily agreed to participate in the study.

Exclusion criteria included:

Individuals not currently working in pharmacy practice;

Incomplete or invalid responses to the questionnaire.

2.2 Sample Size and Sampling Method

The sample si ze was calculated using the formula for estimating a population proportion:

$$n = \frac{Z^2_{1-\alpha/2} \times p(1-p)}{d^2}$$

Assuming an estimated prevalence of 50% (p = 0.5), with a 5% margin of error and a 95% confidence interval, the minimum required sample size was 385. A total of 385 complete and valid responses were obtained for analysis.

A convenience sampling method with regional stratification was used based on geographic distribution across the six study sites.

2.3. Data Collection Instrument

Data were collected using a structured, self-administered questionnaire developed based on literature review and previous studies[4,5]. The questionnaire consisted of five sections:

Section	Content	Number of items
Part I	Demographic and professional characteristics	9
Part II	Knowledge of SF-DS (5-point Likert scale: 1=Strongly disagree to 5=Strongly agree)	10

Section	Content	Number of items
Part III	Attitudes toward SF-DS (5-point Likert scale)	12
Part IV	Practices related to SF-DS	5
Part V	Training needs and recommendations	2 open questions

The reliability of the instrument was assessed using Cronbach's alpha:

Knowledge scale: $\alpha = 0.82$.

Attitude scale: $\alpha = 0.79$.

The attitude scale consisted of 12 items rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). An overall mean attitude score was computed for each participant. Based on the score distribution and prior KAP studies on counterfeit products, a mean score > 4.0 was classified as 'positive attitudes.' The variable was dichotomized accordingly (1 = positive attitudes; 0 = not positive) and used as the dependent variable in the logistic regression model to identify associated factors.

2.4.Data Collection Procedures

Data were collected between January and May 2025 using two methods:

Online survey via Google Forms distributed through professional pharmacy networks;

Paper-based survey administered during regional pharmacy meetings and continuing education events.

Participation was voluntary and anonymous to encourage honest responses.

2.5. Data Processing and Analysis

Data were entered and analyzed using SPSS version 20.0. Descriptive statistics were used to summarize demographic characteristics and KAP scores (frequencies, percentages, means, and standard deviations). Binary logistic regression analysis was employed to identify factors associated with positive attitudes (score > 4/5) toward SF-DS. Odds ratios (OR), 95% confidence intervals (CI), and p-values were reported, with statistical significance set at $p<0.05$.

2.6. Ethical Considerations

Participants were informed of the study objectives, assured of data confidentiality, and provided informed consent prior to participation. No personal identifiers were collected. The study complied with ethical research standards for human participants.

III. RESULT

3.1. Demographic and professional characteristics

A total of 385 retail pharmacy staff participated in the study. The majority were female (62.3%), and nearly half were under 30 years of age (48.4%). Most respondents held a university or postgraduate degree (58.6%) and had 5 - 10 years of work experience (41.8%). Community pharmacies accounted for the highest proportion of workplaces (80.8%). However, only 41.2% had previously received training related to substandard and falsified dietary supplements (SF-DS).

Table 1. Demographic and professional characteristics of participants (n = 385)

Characteristic	n	%
Gender		
Male	145	37.7
Female	240	62.3

Characteristic	n	%
Age (years)		
< 30	186	48.4
30 - 39	122	31.6
≥ 40	77	19.9
Education level		
Intermediate/College	159	41.4
University/Postgraduate	226	58.6
Years of experience		
< 5 years	149	38.7
5 - 10 years	161	41.8
> 10 years	75	19.5
Workplace		
Community pharmacy	311	80.8
Others (wholesaler/hospital pharmacy)	74	19.2
Previous training on SF-DS		
Yes	159	41.2
No	226	58.8

3.2. Knowledge regarding substandard and falsified dietary supplements (SF-DS)

The mean knowledge score among participants was 3.8 out of 5, indicating a generally good level of awareness regarding SF-DS. The majority of respondents correctly recognized key characteristics of SF-DS, such as ingredient falsification and risk of containing prohibited pharmaceutical substances. However, 42.6% of respondents held misconceptions about the legal penalties related to SF-DS, reflecting gaps in understanding of current regulatory frameworks.

Table 2. Knowledge of retail pharmacy staff regarding SF-DS (n = 385)

Item	Statement	Agree/Strongly agree n (%)
K1	SF-DS include products that counterfeit brand names	278 (72.3)
K5	SF-DS may contain banned pharmaceutical substances harmful to health	303 (78.5)
K7	Abnormally low price can be a warning sign of SF-DS	266 (69.1)
K10	*Misconception:* "There are no legal penalties related to SF-DS"	164 (42.6)

Note: Only key knowledge items with highest relevance are presented.

Most participants demonstrated correct understanding of SF-DS risks, consistent with WHO alerts on substandard and falsified health products. However, the misconception about legal sanctions highlights a potential regulatory knowledge gap among pharmacy staff, particularly concerning distinctions between pharmaceutical counterfeiting and SF-DS management under food safety regulations.

3.3. Attitudes toward substandard and falsified dietary supplements (SF-DS)

Overall, participants demonstrated positive attitudes toward preventing SF-DS circulation, with a mean attitude score of 4.1 out of 5. A strong majority agreed that the sale of SF-DS violates professional ethics and poses serious health risks. However, more than half expressed concerns regarding legal liability when unintentionally dispensing SF-DS, and less than one-quarter believed that current enforcement is effective. These findings suggest a cautious yet motivated professional stance, influenced by challenges in regulatory implementation and system support.

Table 3. Attitudes of retail pharmacy staff toward SF-DS (n = 385)

Item	Statement	Mean ± SD	Agree/Strongly agree n (%)
A1	Selling SF-DS is against professional pharmacy ethics	4.36 ± 0.81	336 (87.3)
A2	SF-DS pose serious health risks similar to counterfeit medicines	4.36 ± 0.76	353 (91.6)
A3	The current maximum administrative fine (400 million VND) is adequate as a deterrent	3.28 ± 1.22	182 (47.3)
A4	False advertising of DS should be subject to criminal penalties	3.74 ± 1.13	250 (65.0)
A5	Sanctions for pharmacies selling SF-DS are not strict enough	3.67 ± 1.12	238 (61.7)
A6	I am concerned about legal liability if unknowingly dispensing SF-DS	3.44 ± 1.29	205 (53.3)
A7	Current inspection and enforcement activities are effective	2.68 ± 1.18	93 (24.2)
A8	I am confident in identifying most SF-DS in practice	3.69 ± 1.10	244 (63.3)
A9	Customers are willing to pay higher prices for authentic products	3.61 ± 1.09	232 (60.2)
A10	Regular training on SF-DS detection should be mandatory	4.21 ± 0.87	326 (84.8)
A11	I trust product distributors and rarely recheck product legitimacy	3.09 ± 1.34	150 (38.9)

Attitudes reflect strong professional ethics and awareness of public health risks. Support for mandatory training is notably high (84.8%), suggesting readiness for professional development. However, perceived regulatory inefficiency and fear of legal consequences may discourage proactive reporting of SF-DS among pharmacy staff-an issue requiring structural interventions.

3.4 Practices related to substandard and falsified dietary supplements (SF-DS)

Although the majority of participants reported performing basic verification steps during product procurement, actual actions taken when encountering suspected SF-DS were still limited. Reporting to authorities and implementation of standard operating procedures (SOPs) for handling suspected SF-DS were relatively low, indicating gaps between awareness and real-world practice.

Table 4. Practices related to SF-DS among retail pharmacy staff (n = 385)

Practice item	Response n (%)
B1. Procurement verification	
Check purchase documents/invoices	263 (68.4)
Scan/verify stamp or QR authenticity	176 (45.7)
B2. Encountered suspected SF-DS in the past 12 months	
1-2 cases	125 (32.4)
> 5 cases	47 (12.1)
B3. Action taken when SF-DS suspected	
Refuse to sell	187 (48.6)
Report to regulatory authorities	113 (29.3)
B4. Provide risk counseling to customers	
Frequently	159 (41.2)
B5. SOP for handling suspected SF-DS	
Available and implemented	141 (36.5)

Most respondents conducted basic supply verification (68.4% checked documentation), but more advanced verification using QR code authentication was less common (45.7%). Notably, only 29.3% reported suspicious products to authorities, underscoring potential barriers such as fear of legal consequences, administrative burden, or unclear reporting protocols. The presence of SOPs at pharmacy level remained limited (36.5%), suggesting the need for system-level interventions to improve practice consistency.

3.5. Factors associated with positive attitudes toward SF-DS

Binary logistic regression was performed to identify factors associated with positive attitudes toward SF-DS (defined as an average attitude score > 4.0 on the Likert scale). Three variables showed statistically significant associations: years of professional experience, previous training related to SF-DS, and education level. Gender and age were not significantly associated with attitudes.

Table 5. Factors associated with positive attitudes toward SF-DS (n = 385)

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Years of experience (> 10 years)	2.15	1.18 - 3.92	0.012*
Previous training on SF-DS (Yes vs No)	1.89	1.05 - 3.41	0.034*
Education (University/Postgraduate vs Intermediate /College)	1.67	1.01 - 2.78	0.045*
Gender (Female vs Male)	1.12	0.76 - 1.65	0.568
Age (≥ 40 vs < 40 years)	0.89	0.55 - 1.44	0.631

*Statistically significant at $p<0.05$.

Participants with more than 10 years of experience were over two times more likely to have positive attitudes toward SF-DS control compared to those with shorter experience (OR = 2.15, p=0.012). Similarly, those who had received related training were significantly more likely to demonstrate positive attitudes (OR = 1.89, p=0.034). Higher educational attainment (university/postgraduate) also contributed to attitude

improvement. These findings highlight the importance of professional training and continuous professional development (CPD) in strengthening the role of retail pharmacy staff in combating SF-DS.

3.6. Training needs and recommendations of retail pharmacy staff

Participants expressed a high demand for professional training related to the detection and management of substandard and falsified dietary supplements (SF-DS). The majority preferred interactive and practical learning formats. Suggestions emphasized the need for stronger regulatory enforcement and improvements in reporting systems.

Table 6. Training needs and recommendations to reduce SF-DS (n = 385)

Category	Response option	n (%)
Preferred training formats (multiple choices allowed)		
On-site workshops	201	52.3
Mobile app with detection tools/quiz learning	147	38.1
Free online e-learning modules	107	27.7
Guideline/manual distributed by authorities	67	17.4
Other	24	6.3
Recommendations to reduce SF-DS circulation		
Strengthen inspection and market surveillance	176	45.7
Mandatory training for pharmacists	125	32.4
Improve reporting system (hotline/app)	84	21.8
Harsher legal penalties for violations	44	11.4

The findings revealed strong support for capacity-building interventions among retail pharmacy staff, with 52.3% favoring workshop-based training and 38.1% supporting digital learning via mobile applications. Additionally, nearly half of respondents recommended enhanced surveillance, emphasizing the urgent need for system-level enforcement to combat SF-DS. These insights underscore the feasibility of implementing structured training and reporting mechanisms to strengthen pharmacy-based product quality control.

IV. DISCUSSION

This study is one of the first to examine the knowledge, attitudes, and practices (KAP) of retail pharmacy staff regarding substandard and falsified dietary supplements (SF-DS) in Northern Viet Nam. The findings highlight a relatively good level of knowledge and positive professional attitudes; however, important gaps remain in actual practice, especially in reporting suspicious products and implementing standard operating procedures (SOPs).

The average knowledge score (3.8/5) indicates that most participants understood the key risks associated with SF-DS, particularly product adulteration with banned pharmaceutical ingredients. This aligns with recent WHO reports that emphasize increasing global circulation of falsified health products, particularly in countries with developing regulatory systems[3]. However, 42.6% of participants misunderstood the legal penalties applicable to SF-DS, revealing a gap in regulatory knowledge. Similar findings were reported in a study on counterfeit medicines in Ho Chi Minh City, where only 64.1% of pharmacists received relevant training and many lacked clarity on legal responsibilities[5]. This highlights the need to strengthen regulatory education in community pharmacy settings.

Participants demonstrated positive ethical attitudes toward preventing SF-DS, with 87.3% agreeing that selling falsified products violates pharmacy ethics and 91.6% acknowledging serious health risks. These results are consistent with findings from Ethiopia, where healthcare workers expressed strong ethical concerns regarding counterfeit medicines[8]. However, more than half of the respondents (53.3%) expressed concern about legal liability if they unintentionally sold SF-DS, a factor that may contribute to hesitation in reporting suspected cases. This challenge has been documented globally, where weak legal protection and unclear reporting mechanisms discourage whistleblowing among healthcare workers[7].

In terms of practice, although 68.4% performed basic document verification, fewer respondents applied advanced authentication methods such as QR verification (45.7%). Only 29.3% reported suspicious products to authorities, demonstrating a significant drop from knowledge and attitude to behavior. This knowledge–practice gap is commonly seen in studies of counterfeit product detection worldwide[9]. Lack of SOPs and structured reporting pathways may contribute to this gap. Indeed, only 36.5% of pharmacies reported having an SOP for handling suspected SF-DS.

The regression analysis identified professional experience and training as significant predictors of positive attitudes. Those with > 10 years of experience and previous training were more likely to demonstrate stronger commitment to addressing SF-DS. This supports the Theory of Planned Behavior[6], which suggests that behavioral reinforcement and specific training improve professional responsibility and action.

Potential methodological limitations should also be considered when interpreting the findings of this study. First, the use of a self-administered questionnaire may introduce self-report bias. Participants might overestimate their knowledge or report more desirable attitudes and practices, particularly regarding ethical behaviors or regulatory compliance. This social desirability tendency has been documented in previous KAP studies and may partially explain the discrepancy observed between relatively high knowledge/attitude scores and lower levels of actual reporting behavior in practice.

Second, the study employed a convenience sampling approach across six provinces/cities. Although regional stratification was used to ensure geographic diversity, convenience sampling inherently limits randomness and may lead to selection bias. Pharmacies that are larger, better resourced, or more engaged in professional networks may have been more likely to participate in the survey. As a result, the sample may not fully capture the perspectives of smaller or rural pharmacies with limited capacity or training opportunities.

Third, the representativeness of the sample should be interpreted with caution. While the study covered major provinces in Northern Viet Nam, the findings cannot be generalized to the entire national pharmacy workforce. Differences in socioeconomic conditions, regulatory enforcement, and retail pharmacy structures across regions may influence knowledge, attitudes, and practices toward SF-DS. Future studies using probability sampling or mixed-method approaches could provide a more comprehensive and nationally representative understanding of pharmacy staff readiness to address SF-DS.

Overall, the findings indicate an urgent need for continuous professional development (CPD), clear guidelines, and digital tools for authentication and reporting to enable frontline pharmacy staff to play a stronger role in combating SF-DS in Viet Nam.

V. CONCLUSION

This study highlights key quantitative findings regarding pharmacy staff's readiness to address substandard and falsified dietary supplements (SF-DS). Knowledge levels were moderate (mean 3.8/5), yet 42.6% misunderstood legal penalties and only 78.5% recognized the risk of banned substances in SF-DS. Although attitudes were strongly positive

(mean 4.1/5), with 87.3% acknowledging ethical concerns, over half (53.3%) remained worried about legal liability. In practice, important gaps were evident: Only 45.7% used QR verification and just 29.3% reported suspected cases to authorities. Experience > 10 years (OR = 2.15), prior training (OR = 1.89), and higher education (OR = 1.67) significantly improved attitudes. These results confirm a clear knowledge-practice gap and emphasize the need for targeted training, standardized SOPs, and stronger reporting systems to enhance SF-DS control in community pharmacies.

Legal Documents

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