

Original Article

UNMET EDUCATIONAL NEEDS AND SAFETY SIGNALS IN HEALTH SUPPLEMENT USE IN JAKARTA AND WEST JAVA

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ABSTRACT

Background. Favourable service experience and widespread access to information may coexist with unresolved questions about health supplements.

Research Purpose. To quantify unmatched educational requests, examine the coexistence of positive service experience and safety signals, and translate these findings into a proposed hybrid education design.

Research Method. An exploratory cross-sectional survey included sixty adult supplement users recruited by convenience sampling in Jakarta and West Java. Unmatched requests were topics currently requested but not previously reported as explained. An eleven-item experience mean and three self-reported behaviours, dose escalation, similar-ingredient co-use, and prolonged use without reassessment, were analysed descriptively using within-person matching, Wilson confidence intervals, and sensitivity checks.

Findings. Necessity, product selection, and warning signs were the leading unmatched topics. Equal aggregate receipt and demand for registration information concealed individual mismatches. Positive experience frequently coexisted with behavioural safety signals. Leading priorities persisted after excluding responses exceeding the topic-selection limit. Direct consultation was preferred, with digital channels offering complementary follow-up.

Conclusion. Respondent-level matching reveals educational priorities concealed by aggregate differences. A proposed hybrid pathway combines safety screening, personalised content, checks of understanding, and reassessment. Its effectiveness requires prospective evaluation.

Keywords: Community pharmacy; Digital health literacy; Health communication; Health supplements; Patient experience.

BACKGROUND

Health supplement education concerns how people interpret claims, weigh alternatives, and make decisions in everyday life. It therefore sits at the intersection of health communication, consumer behaviour, adult learning, and community pharmacy practice. Supplement products differ in composition, intended use, and regulatory context; information about their potential benefits does not by itself establish whether an individual needs a particular product [1]. An Indonesian survey after the Delta wave of the COVID pandemic documented supplement consumption alongside gaps in knowledge, supporting the relevance of education beyond product promotion [2]. A systematic review links

supplement-related health literacy with consumption and disclosure behaviours [3], while a working-age adult survey connects literacy with health-behaviour constructs [4]. These associations motivate contextual education without establishing that information alone changes behaviour.

Digital environments add another layer to these decisions. A systematic review identified substantial variation in the quality and accuracy of online nutrition information [5]. A subsequent Australian content analysis found inaccuracies in almost half of assessable Instagram posts, with supplement information performing less well than several other nutrition topics [6]. These findings do not establish what Indonesian respondents encountered, but they make source evaluation and the translation of information into personal decisions relevant educational concerns. Digital health literacy encompasses more than access to a device or confidence in using a platform [7]. Reviews of health misinformation identify a wider information-system problem [8] and variation in individual susceptibility [9]. A review of health-literacy definitions and measurement also highlights the importance of aligning the construct with its instrument [10].

Community pharmacy education can address these concerns through dialogue, contextualised explanations, and opportunities to check understanding. Development of the Perceived Service Quality scale illustrates a structured approach to measuring community-pharmacy experience [11]. Nevertheless, positive evaluations of a service cannot substitute for evidence that a person has understood and applied its content; the pharmacy literature distinguishes satisfaction, experience, and outcomes [12]. A recent scoping review maps community-pharmacy experience research [13], while a qualitative synthesis identifies practical barriers to using experience measures in routine care [14]. Assessments that rely only on favourable ratings may overlook unresolved questions about necessity, duration, concurrent products, or follow-up.

An additional measurement problem arises when prior education and current educational demand are compared only as aggregate percentages. Equal coverage and demand do not imply that the people requesting a topic are the people who received it. Conversely, a negative aggregate difference does not establish that everybody's needs have been met. Matching responses within individuals provides a more actionable account of whom an educational service has yet to reach. Here, an unmet request means a topic was selected as currently needed but was not selected as previously explained. This is an operational measure of reported coverage, not a diagnosis of deficient knowledge.

Safety signals provide a complementary behavioural perspective. In this article, the term denotes self-reported practices that warrant further enquiry, not a pharmacovigilance determination of a new causal association. A person may welcome a consultation yet continue dose escalation or overlapping products. Assessing experience, requested content, and behaviour separately therefore avoids assuming that a favourable interaction necessarily resolves a decision problem.

The present study extends a baseline supplement survey by combining respondent-level matching of educational requests with self-reported safety signals and service experience. Its contribution is a transparent method of setting educational priorities using both expressed demand and behavioural relevance. The objectives were to quantify unmatched educational requests, examine the coexistence of positive service experience and safety signals, and translate these findings into a proposed hybrid education design. These objectives correspond to descriptive topic matching, within-person cross-tabulation, and

interpretation for service design, respectively. The study evaluates neither intervention effectiveness nor the clinical appropriateness of individual products.

RESEARCH METHOD

Study design and setting

This exploratory cross-sectional analysis used the baseline needs-assessment phase of a grant-funded programme developing patient-experience-oriented pharmacy education. The available dataset comprised two online survey exports, each containing thirty respondents, with recorded completion timestamps from 25 to 26 August 2026. Participants resided in DKI Jakarta or West Java. Recruitment was non-probability convenience sampling, as documented in the source manuscript. The exports do not provide the invitation denominator or a complete recruitment log; consequently, a response rate and facility-specific recruitment proportions could not be calculated. The analysis used all available eligible records rather than a sample selected to demonstrate a statistically significant effect. This available-sample rationale is reported explicitly, consistent with guidance that sample-size justification should reflect the study objective and inferential constraints [15].

Participants and data provenance

Eligibility required voluntary agreement, adulthood, residence in the target provinces, understanding of the survey definition, and self-reported use of at least one product considered a health supplement in the preceding thirty days. All sixty records indicated consent, understanding, and recent use; ages ranged from eighteen to forty-six years. Each workbook contained a labelled Summary sheet and a numeric Coding sheet describing the same respondents. Only one record per respondent was analysed. The two exports contained sixty unique respondent identifiers with no between-file identifier duplication.

Direct questionnaire answers were prioritised over duplicated export-profile fields. Three gender entries and six province entries differed between these sources after normalising punctuation and case. Gender and province in this article therefore use D01 and S06, respectively; numerical age uses the export's age field because the questionnaire otherwise records age categories. No records were deleted on the basis of these discrepancies. Product identity, ingredients, doses, and clinical indications were not independently verified. The population is accordingly described as self-identified supplement users rather than users of exclusively regulator-verified supplement products.

Measures and operational definitions

The primary analytic outcome was the proportion of respondents with an unmatched request for each paired topic. Secondary descriptive outcomes were the experience composite, the prevalence and count of behavioural safety signals, and their within-person co-occurrence. Digital influence and preferred delivery channels informed the proposed education design. These domains were not designated causal exposures and outcomes, and no mediation or intervention effect was estimated.

Previously received education was measured by E03, an unrestricted multiple-response question about topics ever explained. Current educational priorities were measured by N02, which requested a maximum of five topics. Eleven conceptually corresponding topic pairs were specified for this analysis. These included necessity, product selection, ingredients and function, dose and timing, duration, warning signs, interactions, duplication, registration, storage, and consultation. Pairing ingredients with ingredients and

function is approximate; the original wording is retained in the accompanying analysis documentation. Benefits alone, affordability, alternatives to supplements, vulnerable-group safety, and digital-claim appraisal were not forced into non-equivalent pairs.

For each topic, receipt and request were coded as selected or not selected. An unmatched request required a selected N02 response and an unselected corresponding E03 response in the same record. All respondents selected at least one N02 option, so unchecked options within this block were interpreted as non-selection rather than a wholly unanswered question. Four states were distinguished: request with prior receipt, request without prior receipt, prior receipt without current request, and neither. The sample proportion with an unmatched request was the number in the second state divided by sixty. The net coverage difference was the request percentage minus the receipt percentage. Neither measure establishes that education was insufficient, forgotten, or clinically required.

The patient-reported experience measure comprised eleven P02 statements rated from strongly disagree to strongly agree on a five-point scale. Responses indicating no experience or not applicable were excluded. A complete-case mean was calculated only when all eleven items were valid. A mean of at least four described a positive experience for this exploratory cross-tabulation; it is not a validated clinical cutoff. Internal consistency was estimated using Cronbach's alpha as a sample-specific descriptive property, not evidence of construct validity. Contemporary COSMIN guidance distinguishes content validity and other measurement properties from internal consistency [16]; no formal COSMIN validation was undertaken in this exploratory analysis.

Three R01 statements represented safety signals: increasing the dose to obtain faster benefits, using products with similar ingredients simultaneously, and continuing long-term use without reassessing benefits and risks. Responses of sometimes, often, or always qualified as signals; rarely and never did not. Not-applicable responses were treated as missing for that item. These signals indicate behaviours meriting clarification, not confirmed overdose, toxic exposure, or adverse events. A complete-case count ranged from none to three signals. Digital appraisal, influencer influence, media preference, and technical access items were reported separately rather than combined into a single digital-literacy score.

The questionnaire was locally assembled for the parent programme. The available documentation does not establish independent criterion validation of the experience composite or the behavioural thresholds. Consequently, the three safety items were retained as separate indicators, with a count used only to summarise their co-occurrence. A high count cannot quantify severity, identify a specific interaction, or establish clinical injury.

Analysis and sensitivity checks

Analysis used Python, NumPy, and scripted tabulation of the survey workbooks. Counts and percentages describe categorical variables; means and standard deviations describe age and the experience composite. Wilson 95% confidence intervals were calculated for unmatched-request proportions and individual safety signals. Recent methodological work evaluates Wilson alongside other binomial intervals and emphasises that interval width must be considered together with coverage [17]. Here, intervals describe model-based uncertainty around sample proportions; they neither correct convenience-sampling bias nor establish provincial prevalence. Each interval used the number with the outcome as its numerator and respondents with an evaluable item as its denominator. Multiple-response percentages may exceed 100% when summed. No imputation, weighting, hypothesis-test-

based selection, or causal modelling was undertaken, consistent with the exploratory, available-sample rationale [15].

Ten respondents selected more than five N02 options. The main analysis retained their recorded choices rather than arbitrarily dropping selections. A sensitivity analysis excluded these ten records and repeated the matched-topic tabulations. A second sensitivity analysis used the more restrictive often-or-always threshold for safety signals. All outcomes and pairings in this article are exploratory secondary specifications; no claim of prospective registration is made. The analysis documentation provides the mapping, denominators, and code needed to reproduce the tabulations.

The co-occurrence analysis first selected respondents with complete experience and safety data, then counted safety signals within the subgroup whose experience mean was at least four. It answers whether these features occur in the same people; it does not compare risks between experience groups. All three study objectives were addressed in sequence: topic matching identified priorities, cross-tabulation described coexistence, and the resulting patterns informed an explicitly untested service proposal.

Ethics

The Research Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta approved the parent study on 28 July 2026, approval number 209/VII/2026/KEP. The supplied approval names the programme developing patient-experience-oriented education for rational supplement use in community pharmacy facilities. Participation was voluntary and all analysed respondents recorded consent. Results are presented in aggregate; respondent identifiers and free-text health information are not disclosed in the manuscript or accompanying analysis package.

FINDINGS

Respondent profile and educational exposure

Mean age was 29.85 years with a standard deviation of 5.99 years. Direct questionnaire responses identified 37 men and 23 women, with 39 respondents in DKI Jakarta and 21 in West Java. Most had completed senior secondary or bachelor-level education. Routine prescription medicine use was reported by 39/60 respondents (65.0%), and 35/60 (58.3%) reported using at least two supplements. These characteristics describe the sample rather than provincial populations (Table 1).

Fifty-six respondents reported receiving a professional explanation about supplements in the previous twelve months: twenty-six from pharmacy personnel, twenty-two from doctors, and eight from other health professionals. One reported no such explanation and three did not remember. In the separate E03 question, benefits were the most frequently selected previously explained topic, reported by 49/60 respondents (81.7%). Necessity was reported by 13/60 (21.7%), interactions by 6/60 (10.0%), and duration or stopping by 4/60 (6.7%). Because E01 specifies a twelve-month professional-contact window whereas E03 asks about topics ever explained, these responses were not treated as identical measures of service coverage.

Matched educational requests and aggregate differences

At least one unmatched request across the eleven paired topics was present in 58/60 records (96.7%). Twenty-one respondents had one unmatched topic, twenty-five had two, seven had three, two had four, and three had five. This high proportion concerns reported

topic coverage under the operational definition; it is not an estimate of the prevalence of inadequate knowledge. Table 2 presents both marginal counts and within-person matching.

Table 1. Characteristics and professional educational exposure (N = 60).

Characteristic	n (%) or mean (SD)
Age in years; range 18–46	29.85 (5.99)
Male / female, questionnaire D01	37 (61.7) / 23 (38.3)
DKI Jakarta / West Java, S06	39 (65.0) / 21 (35.0)
Senior secondary education	25 (41.7)
Diploma / bachelor / postgraduate or professional	2 (3.3) / 30 (50.0) / 3 (5.0)
Routine prescription medicines: none / one / two to four	21 (35.0) / 17 (28.3) / 22 (36.7)
Supplement products: one / two / three or four	25 (41.7) / 18 (30.0) / 17 (28.3)
Professional explanation in previous twelve months	56 (93.3)

Table 2. Matched educational coverage and current requests (N = 60).

Topic	Received n	Requested n	Unmatched n (%)	Net gap pp
Need for supplementation	13	34	26 (43.3)	+35.0
Product selection	26	39	18 (30.0)	+21.7
Ingredients and function	37	36	10 (16.7)	-1.7
Dose and timing	34	36	10 (16.7)	+3.3
Duration and stopping	4	12	9 (15.0)	+13.3
Adverse effects and warning signs	20	28	17 (28.3)	+13.3
Drug or disease interactions	6	12	8 (13.3)	+10.0
Ingredient duplication	5	7	6 (10.0)	+3.3
Registration and authenticity	9	9	6 (10.0)	+0.0
Storage	4	5	3 (5.0)	+1.7
When to consult	3	2	2 (3.3)	-1.7

Unmatched = requested without reporting previous receipt in the same respondent. Net gap = requested minus received percentage; pp = percentage points. E03 and N02 are multiple-

response items with different recall frames. Pairing of ingredients with ingredients and function is approximate.

The receipt-without-request group is relevant to interpreting the net gap: the net difference equals unmatched requests minus receipt without current request, expressed as a percentage of the sample. It is therefore a balance between two different groups, not the number of people whose stated request lacks prior coverage.

The largest unmatched request concerned whether supplementation was needed: 26/60 respondents (43.3%; 95% confidence interval 31.6–55.9). Of the thirty-four respondents requesting this topic, eight reported previous receipt and twenty-six did not; thus, 76.5% of those requesting it lacked reported prior coverage. Product selection had the highest overall demand, but a smaller unmatched proportion, 18/60 (30.0%; 19.9–42.5), because twenty-one of the thirty-nine requesters also reported prior education. Adverse effects and warning signs accounted for seventeen unmatched requests (28.3%; 18.5–40.8).

The distinction between net differences and individual matching changed interpretation for several topics. Ingredients and function had a negative net difference of 1.7 percentage points, yet ten respondents still requested the topic without reporting prior receipt. Registration and authenticity had equal marginal counts of nine received and nine requested, but only three respondents selected both; six therefore had an unmatched request. A zero aggregate difference concealed a person-level mismatch rather than demonstrating complete coverage. Figure 1 displays uncertainty around unmatched proportions without implying statistically separable ranks.

When the ten records exceeding the five-choice instruction were excluded, necessity remained the largest unmatched category, 24/50 (48.0%), followed by product selection, 17/50 (34.0%), and warning signs, 15/50 (30.0%). The corresponding main-analysis values were 43.3%, 30.0%, and 28.3%. The principal priority pattern persisted, although some lower-frequency topics changed more substantially; duration and stopping declined from 9/60 (15.0%) to 4/50 (8.0%). This sensitivity check supports the leading descriptive priorities without removing uncertainty in the underlying responses.

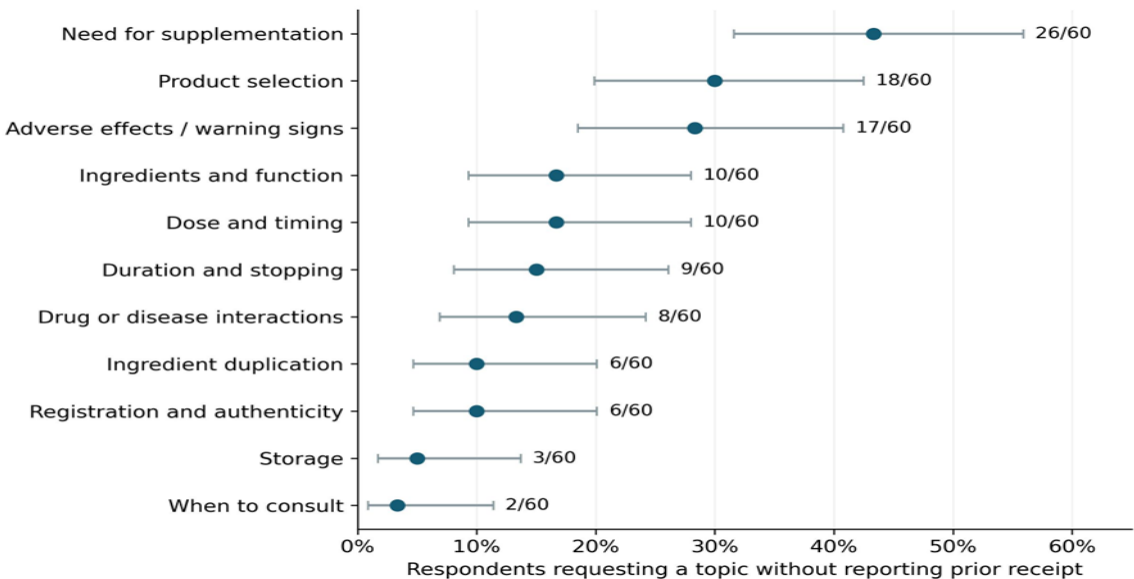


Figure 1. Respondent-level unmatched educational requests. Dots show percentages of all sixty respondents; horizontal lines show Wilson 95% confidence intervals. Topics are ordered descriptively, without significance testing of ranks.

Positive experience and concurrent safety signals

The experience composite was available for fifty-nine respondents, with a mean of 4.50 and standard deviation of 0.42; Cronbach's alpha was 0.915. Fifty-four of fifty-nine respondents (91.5%) had a mean of at least four. Twenty-four of the fifty-nine complete cases gave identical responses across all eleven experience items. This pattern is compatible with genuinely uniform perceptions but also warrants caution about restricted response variation and response style.

Table 3. Self-reported safety signals at the sometimes-or-more threshold.

Signal	n/N (%)	95% CI (%)
Self-increased dose for faster benefits	28/60 (46.7)	34.6–59.1
Simultaneous similar-ingredient products	34/60 (56.7)	44.1–68.4
Long-term use without reassessment	36/59 (61.0)	48.3–72.4

CI = Wilson confidence interval. One not-applicable response was excluded from the long-term-use denominator. These are reported behaviours, not confirmed clinical harms.

Among fifty-nine respondents with all three safety items available, forty-one (69.5%) reported at least one signal. Eighteen reported none, eleven reported one, three reported two, and twenty-seven reported all three. Among the fifty-four respondents with positive experience and complete safety data, thirty-eight (70.4%) reported at least one signal (Figure 2). Positive experience and reported risk-related behaviours therefore coexisted within individuals, rather than only in separate aggregate percentages. This cross-tabulation does not show that favourable experience causes risk or that previous counselling was ineffective.

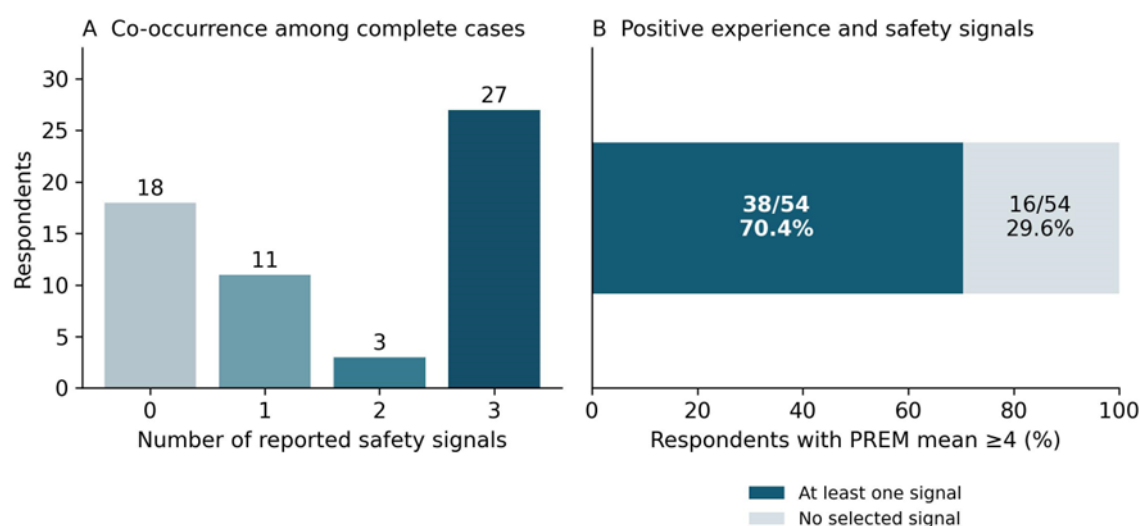


Figure 2. Co-occurrence of safety signals and positive experience. Panel A includes fifty-nine complete safety records. Panel B includes fifty-four respondents with an experience mean of at least four and complete safety data. All measures were recorded in the same survey.

Using the stricter often-or-always threshold, dose escalation was reported by 24/60 (40.0%), similar-ingredient co-use by 30/60 (50.0%), and long-term use without

reassessment by 28/59 (47.5%). The direction of the descriptive concern was unchanged, although its magnitude depended on the chosen threshold. The clustering of all three signals also requires interpretation alongside the possibility of response-style effects; the questionnaire did not independently observe these behaviours.

Digital influence and delivery preferences

Fifty-one respondents (85.0%) agreed or strongly agreed that influencer content or consumer reviews affected purchasing decisions. This combined item does not isolate the influence of professional influencers from that of other customers. Only six respondents (10.0%) selected digital-claim appraisal among their priority educational topics. These measures capture different constructs: reported influence is not equivalent to trust, and failure to select a topic under a five-choice limit does not prove lack of interest or lack of need.

Fifty-seven respondents (95.0%) agreed that they could access education through QR codes, WhatsApp, or links. This is perceived technical capability, not demonstrated digital literacy or a direct measure of willingness to use a particular service. Forty-one respondents selected in-person pharmacy consultation (68.3%), thirty selected in-person primary-care consultation (50.0%), and twenty-four selected chat or WhatsApp (40.0%). Fourteen selected QR codes on receipts or packaging (23.3%). Forty-four preferred education before choosing or buying a product (73.3%). Thirty requested messages to assess benefits or complaints after education (50.0%), supporting a design that includes review rather than only reminders to continue use.

DISCUSSIONS

Educational priority depends on matching people and topics

The principal contribution is methodological and practical: matching receipt and demand within the same respondent identifies educational requests that aggregate subtraction misses. Necessity was the leading unmatched topic, while product selection generated the highest overall demand. These observations support different service decisions. A broadly available product-selection module may reach many interested users; a targeted necessity conversation may address a larger proportion whose request has no reported prior coverage. Neither ranking alone should determine a complete curriculum.

The ingredients example illustrates why “coverage exceeds demand” should not be interpreted as educational adequacy. Prior coverage may have reached different people, may have occurred long ago, or may have concerned a different product. Conversely, respondents who selected both receipt and demand may want reinforcement or more personalised explanations. They should not automatically be classified as having no further educational need. The unmatched measure is deliberately narrow: it estimates missing reported exposure among current requesters, while leaving the quality and sufficiency of prior explanations unresolved.

Comparison with earlier surveys clarifies this distinction. In the Indonesian study by d’Arqom et al., 59.52% of respondents had good knowledge and 7.21% had excellent knowledge [2]. Our 96.7% with an unmatched request does not contradict those findings because requesting an unexplained topic is not equivalent to failing a knowledge test. Different recruitment settings and the post-Delta pandemic context further limit direct comparison. Tan et al. studied 1,714 Chinese adults and found that 29.1% answered at least seven of ten knowledge questions correctly; greater knowledge was associated with

seeking medical advice for discomfort [18]. Both studies support attention to informed decisions, but neither used our paired receipt–request indicator. The added contribution here is identifying which content to discuss with which respondent, rather than estimating another knowledge prevalence.

A decision-oriented conversation could begin with the person’s goal, existing diet, concurrent medicines, and reason for considering a supplement. The educational outcome would be a reasoned decision to use, defer, seek further advice, or consider an alternative, rather than the number of product facts recalled. The Indonesian evidence on supplement knowledge provides context for this approach [2], but the present sample adds a distinct person-level assessment of the content respondents want. It does not establish that necessity counselling reduces unnecessary purchasing; that remains an intervention question. The necessity conversation should also distinguish supplementation for a specific indication from routine disease prevention. An updated evidence review found little or no preventive benefit for most vitamin and mineral supplements in adults without known deficiencies, with limited exceptions [19]. The related USPSTF recommendation does not support assuming a general preventive benefit and recommends against beta-carotene or vitamin E for preventing cardiovascular disease or cancer [20]. These findings inform explanation of uncertainty; they do not determine whether any respondent’s supplement was indicated.

Safety content cannot rely entirely on expressed demand

Interactions and duplication were requested less frequently than product selection or ingredients, yet routine prescription medicine use and similar-ingredient co-use were common. Expressed demand may therefore underrepresent topics deserving professional screening. This does not establish that every combination is harmful: total ingredient exposure, prescribing intent, timing, and individual contraindications were not verified. AlTarrah et al. similarly used a non-probability online survey of young adults in Kuwait, but measured supplement use and self-reported adverse events [21]. Our 69.5% with at least one behavioural signal is not an adverse-event rate and cannot be compared directly with their harm estimates. Differences in outcome definition, product mix, health conditions, and recruitment could produce different proportions without contradictory findings. A review of supplement–medicine interactions in older adults supports ingredient-specific assessment [22], although that population differs from our younger sample. Both comparisons favour reviewing actual products and medicines before assigning clinical risk.

The analysis supports a two-part curriculum: a brief safety core relevant to the person’s circumstances, supplemented by modules chosen from their unmet requests. For example, a patient using several products could be invited to bring labels or photographs so that overlapping ingredients can be examined. A duration conversation could ask what benefit is expected, when that benefit will be reviewed, and what would trigger reassessment. These are proposed educational actions derived from the findings; their feasibility and effects have not been measured here.

The education of professionals also matters. In a Polish survey of 743 healthcare workers, 84.52% considered supplement composition a key factor in recommending a product, while only 7.00% reported using official information sources [23]. This provider perspective complements our consumer finding that ingredient duplication and interactions were infrequently requested. The populations and questions differ, so the percentages cannot be treated as a shared performance benchmark. Nevertheless, together they suggest

that a personalised curriculum should include reliable source use and label review by the educator, as well as opportunities for users to express priorities.

Experience is valuable but does not establish understanding or application

The coexistence of positive experience and safety signals is more informative than contrasting sample-wide percentages. It indicates that favourable interactions can occur in the same respondents who report behaviours needing clarification. Experience measures remain useful for identifying whether people felt heard, included, and able to ask questions [11]. However, these outcomes are different from being able to compare two labels, explain a stopping decision, or identify when consultation is needed. The broader literature similarly argues for assessing services beyond satisfaction alone [12].

This pattern is consistent with Murry and Desselle's argument that person-centred pharmacy assessment should extend beyond satisfaction [12], but it is not a replication of an intervention effect. Carter et al. developed and evaluated a specific community-pharmacy experience instrument [11]; our locally assembled items cannot be assumed equivalent merely because internal consistency is high. The practical similarity is that experience captures an important service dimension. The difference is evidential: the present cross-tabulation documents concurrent self-reports without validating the scale or observing subsequent decisions. The 70.4% co-occurrence therefore motivates separate behavioural assessment rather than a conclusion that professional education failed.

The present experience scale was locally assembled, and high internal consistency should not be interpreted as proof of external validity or equivalence to published instruments. The concentration of favourable responses and identical item patterns limits discrimination. Accordingly, the proposed evaluation strategy combines experience with short observed decision tasks and follow-up documentation. A patient could explain the intended use in their own words or compare ingredient lists while the educator checks understanding. Such tasks would test application more directly than another confidence rating, but their validity and acceptability would need to be established. Teach-back offers one candidate approach: a systematic review in chronic kidney disease reports potential educational benefits but heterogeneous evidence [24]. Its transfer to supplement counselling therefore requires local testing rather than an assumption of equivalent effectiveness.

Digital education should connect influence with supported decisions

The combination of reported digital influence and limited prioritisation of digital-claim appraisal suggests an educational design question rather than a demonstrated literacy deficit. Respondents may prefer immediately actionable product questions, assume they can already judge claims, or omit digital appraisal because of the selection limit. The data cannot distinguish these explanations. It would therefore be inappropriate to combine influencer susceptibility, visual-format preference, and technical access into one favourable literacy score or use it to claim that digital competence protects against risk.

External evidence nevertheless supports examining the information environment. The Australian Instagram study assessed content directly and found that popularity indicators did not reliably identify accurate information [6]. In the present setting, claim-appraisal activities could ask users to distinguish a product advertisement from an evidence summary, identify the source, and explain whether the claim applies to their circumstances. A review of interventions to improve identification of trustworthy digital information highlights guided skill-building and user-centred delivery as useful approaches [25]. These

sources inform the design proposal; they do not validate the local questionnaire or demonstrate its effectiveness. Social-media information principles developed through a Delphi study offer criteria for examining credibility and communication quality [26]. Prebunking research provides a rationale for showing how misleading claims work before users encounter them [27]. Recent reviews of eHealth-literacy interventions report improvements in measured literacy, while highlighting differences in educational approaches and evaluation [28,29]. A local module could combine source appraisal with an ingredient-label task; whether these skills transfer to purchasing decisions or reduce harm remains unknown.

In-person pharmacy consultation was the most frequently selected medium, while chat access and benefit-review messages were also requested. This pattern favours a hybrid service in which digital materials reinforce a conversation and provide a route back to a professional. Indonesian telepharmacy research has documented uneven service processes, including gaps in documentation and monitoring [30]. A scoping review likewise identifies implementation barriers and inequities alongside the potential of virtual community pharmacy care [31]. Hence, choosing WhatsApp or a QR code is only a delivery decision; it does not itself create a complete educational service.

The apparent tension between 95.0% perceived technical access and 68.3% selecting in-person pharmacy consultation is compatible with complementary channel use: respondents could choose multiple media, and access does not measure preference. This aligns with virtual-pharmacy research that treats implementation, accessibility, and service processes as separate concerns [30,31]. Likewise, the digital-literacy intervention reviews assess changes after education [28,29], whereas our survey only describes starting preferences and reported influence. Differences in instruments, clinical settings, and study designs preclude importing their effect sizes. A locally tested hybrid service should evaluate uptake and demonstrated appraisal skills separately.

Implications for service design and future evaluation

Table 4 translates the findings into a proposed educational pathway. The model combines an initial safety review, individually selected content, verification of understanding, and an agreed opportunity for reassessment. It is a design implication rather than a validated intervention. Printed or face-to-face alternatives should remain available because the present sample cannot represent people with limited digital access, older adults, or those who would not complete an online survey.

This pathway is an untested design proposal informed by the survey; candidate measures were not outcomes of the current study.

A subsequent feasibility study should first assess comprehension of questionnaire wording and the burden of the proposed consultation. A controlled evaluation could then compare usual education with the proposed pathway using independently assessed decision tasks, verified product lists, and prospectively recorded follow-up. Baseline educational exposure and concurrent medicine use should be measured, and the primary outcome specified before recruitment. Experience, uptake, task performance, and verified safety outcomes should remain distinct endpoints. Evidence of improved satisfaction alone would not establish safer supplement use. The updated Cochrane review of decision aids supports explicitly presenting options and helping people clarify what matters to them [32]. This supports evaluating decision quality in a future supplement study, while preserving the distinction between evidence from other decisions and effectiveness in this setting.

For educational and service-management research, the practical value lies in making the allocation rule explicit. A brief safety review reduces reliance solely on the topics users happen to request; person-level matching directs optional content to stated gaps. The rule can be tested and revised without presenting a new composite score as a validated instrument. This connection between consumer information, learning needs, and service design places the research within the multidisciplinary study of communication and education.

Table 4. Proposed educational pathway and candidate evaluation measures.

Stage	Educational action	Candidate measure
Initial safety review	Review goals, current products and medicines; clarify overlapping ingredients.	Documented review of product list.
Personalised content	Prioritise unmatched requests about necessity, selection, and warning signs.	Coverage of the person's selected topics.
Check application	Ask the user to explain the decision or compare two ingredient labels.	Observed task performance, assessed independently.
Hybrid follow-up	Agree on a review point and a channel to discuss benefits or complaints.	Completed review and documented next decision.

Strengths and limitations

Strengths include direct reanalysis of respondent-level data, verification that labelled and coded worksheets did not represent separate samples, explicit topic pairing, transparent denominators, and sensitivity checks. Ethical approval was confirmed from the supplied approval document. The analysis also distinguishes actual within-person co-occurrence from an inference based solely on separate group averages.

Several limitations constrain interpretation. The sample was small, non-probability, relatively young, and digitally recruited; regional or national prevalence estimates are not justified. The invitation denominator and detailed recruitment process were unavailable. Age was taken from export metadata, while discrepancies in repeated demographic fields indicate imperfect data consistency. Ten respondents exceeded the N02 selection limit, and exclusion sensitivity cannot determine which of their selections would otherwise have been retained. Prior receipt and current demand have different timeframes and partly different wording, while recall of education may be incomplete. Their matching is an analytic approximation rather than a longitudinal assessment.

All behavioural and experience measures were self-reported in one survey. Positive response tendencies, recall error, and misunderstanding of reverse-direction safety items may influence results. The methodological literature on common-method bias cautions that shared measurement methods can distort observed relationships [33]. Co-occurrence is therefore reported descriptively without treating it as an independently verified association. The concentration of all three safety signals and uniform experience responses warrants cognitive interviewing and independent verification in later research. Product

classifications and prescription medicine use were not externally checked, and no adverse event was clinically adjudicated. There was no intervention, follow-up comparison, or temporal evidence that education preceded the reported behaviours. The findings therefore generate priorities and testable design propositions, not causal conclusions or proof of clinical benefit.

CONCLUSION

Respondent-level matching identified educational requests that aggregate coverage differences could conceal. Whether supplementation was needed, how to choose products, and how to recognise adverse effects emerged as leading priorities. Positive service experience coexisted with reported safety signals, supporting the separate assessment of experience, understanding, and behaviour. A proposed hybrid education pathway should combine individual requests with professional safety screening and opportunities for reassessment. Its effectiveness and equity require prospective evaluation.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflicts of interest related to this research or its publication.

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