

Impact of an Educational Intervention on the Knowledge, Attitude and Practice of Community Pharmacists Regarding Medication Safety During Pregnancy: A Pre-Post Interventional Study

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ABSTRACT

Background and Objectives: Medication use in pregnancy demands a careful balance between maternal therapeutic needs and fetal safety. Community pharmacists, being the most accessible point of contact for the public, are pivotal in counselling pregnant women on safe medication use. This study assessed the baseline Knowledge, Attitude and Practice (KAP) of community pharmacists regarding medication safety during pregnancy, delivered a structured educational intervention, and evaluated the change in KAP thereafter. **Materials and Methods:** A single-group pre-post interventional study was conducted over six months among 70 registered community pharmacists in the urban area of Bagalkote. Baseline KAP was captured using a pre-tested, structured questionnaire of six knowledge, six attitude and six practice items. A multimodal intervention (presentation, video and leaflet) was delivered, and KAP was reassessed two months later. Scores were summed (range 6-12 per domain) and analysed using the paired *t*-test, with $p < 0.05$ considered significant. **Results:** Participants were predominantly male (91.4%), aged 20-29 years (41.4%) and held a diploma in pharmacy (57.1%). Good knowledge rose from 50.0% to 97.1%, positive attitude from 75.7% to 98.6%, and safe practice from 28.6% to 97.1% after the intervention. Mean domain scores improved significantly: knowledge 8.57 ± 0.99 to 10.65 ± 0.92 , attitude 9.01 ± 0.86 to 10.11 ± 0.79 , and practice 7.81 ± 1.07 to 10.14 ± 0.95 (all $p < 0.001$). **Conclusion:** Community pharmacists exhibited substantial baseline deficits in medication-safety competencies during pregnancy. A brief, structured educational intervention produced statistically significant gains across all three domains, supporting the integration of continuing pharmacy education into community practice.

Keywords: Attitude, Community Pharmacist, Educational Intervention, Knowledge, Medication Safety, Pregnancy.

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INTRODUCTION

Pregnancy is a physiologically dynamic state in which maternal pharmacokinetics, placental drug transfer and fetal vulnerability intersect to make medication use uniquely complex. Although drug therapy in pregnancy can seldom be avoided entirely-many women contend with conditions such as nausea, diabetes, asthma or hypertension that require treatment-every exposure must be weighed against the potential for fetal harm (George *et al.*, 2011). Most medicines reach the market without robust clinical-trial evidence on gestational risk, which places a heavy interpretive

burden on the health professionals who prescribe and dispense them (Schwarz *et al.*, 2009).

The scale of maternal morbidity sharpens the relevance of this issue. The World Health Organization has estimated that a large share of maternal deaths are preventable through appropriate care during pregnancy and labour, and that hundreds of millions of women live with pregnancy-related morbidity worldwide (Hafez, 1998; Veneman, 2008). Within this care pathway, safe medication use is a modifiable determinant of outcome, and the professionals who govern access to medicines carry a corresponding responsibility.

Among health professionals, community pharmacists occupy a distinctive position: they are the most accessible, often the first and sometimes the only point of contact for women seeking remedies for common ailments (Leung *et al.*, 2018). Globally, pharmacists are regarded as medication experts, equipped to counsel pregnant women on the risks of prescription and



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non-prescription drugs, herbal preparations and substances of abuse (Zaki *et al.*, 2014). Where community pharmacy services are stretched by population pressures and a high proportion of minimally qualified dispensers, the quality of medication advice in pregnancy may be compromised (Jagarlamudi *et al.*, 2018).

Evidence on the specific competencies of community pharmacists in safe medication use during pregnancy remains limited, and interventional evidence demonstrating that these competencies can be improved is scarcer still (Devkota *et al.*, 2017). Against this background, the present study was undertaken with three objectives: to assess the baseline Knowledge, Attitude and Practice (KAP) of community pharmacists regarding medication safety during pregnancy; to deliver a structured educational intervention; and to evaluate the change in KAP following that intervention.

MATERIALS AND METHODS

Study design and setting

A single-group, pre-post educational interventional study was conducted over a six-month period among community pharmacists practising in the urban area of Bagalkote. The phased timeline encompassed area mapping, tool development, a pilot phase, baseline data collection, the educational intervention, post-intervention data collection, and analysis.

Study population and sampling

The study population comprised registered community pharmacists holding at least a Diploma in Pharmacy. Pharmacists willing to participate were included; those unwilling to participate or not engaged in community practice were excluded. The sample size was derived using OpenEpi version 2, taking the proportion of subjects with optimal knowledge of safe practice in pregnancy as 45.9% (Narayana *et al.*, 2019), an absolute precision of 12% and a 95% confidence level, yielding a required sample of 70 participants.

Data collection instrument

A pre-designed, pre-tested, structured, self-administered questionnaire was used. It comprised four sections: demographic details (age, gender, qualification, experience) and three KAP domains of six items each. Knowledge items addressed the potential harm of over-the-counter, topical and herbal preparations and the role of iron, folic acid and calcium supplementation, together with awareness of teratogenicity. Attitude items captured confidence, caution and risk perception in dispensing. Practice items addressed counselling behaviour, the use of drug-information resources and the habit of updating one's knowledge. Each completed interview required approximately 20-25 min.

Scoring

Each domain contained six items scored 2 for a correct response and 1 for an incorrect response, giving a domain range of 6-12. For knowledge, scores of 10-12 denoted good knowledge and 6-9 poor knowledge; for attitude, 10-12 denoted a positive attitude and 6-9 a negative attitude; for practice, 10-12 denoted safe practice and 6-9 unsafe practice.

Intervention

Following baseline assessment, a structured multimodal educational intervention was delivered comprising a PowerPoint presentation, a supporting video and a printed leaflet addressing safe medication use during pregnancy. KAP was reassessed using the same instrument two months after the intervention, an interval chosen to allow inference about retained learning rather than the immediate recall of intervention content.

Ethical approval

The study was approved by the Institutional Ethics Committee of Hanagal Shri Kumareswar College of Pharmacy, Bagalkote (Ref. No. HSKCOP/IEC/23/6, dated 21 March 2023). Written informed consent was obtained from every participant after the nature and purpose of the study were explained, and confidentiality was assured throughout.

Statistical analysis

Data were compiled in Microsoft Excel. Categorical variables were summarised as frequencies and percentages. Pre- and post-intervention mean domain scores were compared using the paired *t-test*, with $p < 0.05$ considered statistically significant.

RESULTS

Of the 70 community pharmacists enrolled, the majority were male (91.4%), aged 20-29 years (41.4%), held a Diploma in Pharmacy (57.1%) and had 0-10 years of professional experience (58.6%). The full demographic profile is presented in Table 1.

Marked shifts were observed across all three domains after the educational intervention. Good knowledge increased from 50.0% to 97.1%, positive attitude from 75.7% to 98.6%, and safe practice from 28.6% to 97.1%. The pre- and post-intervention category distributions are shown in Table 2.

At the item level, the proportion of participants giving the correct response rose for every knowledge, attitude and practice item assessed. The most pronounced gains were recorded for awareness that over-the-counter medicines may be harmful (60.0% to 97.1%), recognition of teratogenicity and its effects (21.4% to 75.7%), and the practice of consulting a drug-information resource before dispensing to a pregnant woman (17.1% to 85.7%). The item-wise responses are summarised in Table 3.

The mean domain scores improved significantly after the intervention. Knowledge rose from 8.57 ± 0.99 to 10.65 ± 0.92 , attitude from 9.01 ± 0.86 to 10.11 ± 0.79 , and practice from 7.81 ± 1.07 to 10.14 ± 0.95 . The paired *t*-test confirmed that all three changes were highly statistically significant ($p < 0.001$), as shown in Table 4.

DISCUSSION

This interventional study set out to measure, and then to improve, the competencies of community pharmacists in medication safety during pregnancy. The baseline picture was sobering: only half of the participants demonstrated good knowledge, fewer than three in ten followed safe dispensing practices, and awareness of teratogenicity was strikingly low. These deficits are concerning given that community pharmacists are frequently the first professionals a pregnant woman consults about a minor ailment.

The demographic profile helps to contextualise these findings. Most participants held only a diploma qualification and had limited professional experience, a pattern that mirrors earlier observations from community-pharmacy settings and that has been linked to weaker medication-safety competencies (Jagarlamudi *et al.*, 2018). The predominance of male, early-career, diploma-qualified dispensers suggests that any strategy to raise the standard of pregnancy-related counselling must reach precisely this group.

The central finding is that a brief, structured educational intervention produced large and statistically significant gains across all three domains. Good knowledge nearly doubled, positive attitude approached universality, and safe practice rose more than threefold. The magnitude of these shifts is consistent with prior work showing that targeted counselling and education can meaningfully improve medication-related KAP among pharmacy personnel and pregnant women alike (Devkota *et al.*, 2017). The parallel improvement in attitude and practice alongside knowledge supports the view that knowledge deficits sit upstream of the cautious-but-uninformed behaviour observed at baseline.

Certain items proved more resistant to change than others. Awareness of the potential harm of herbal preparations, and the habit of routinely consulting drug-information resources,

improved but remained imperfect after a single intervention—an indication that some behaviours require reinforcement rather than a one-off exposure. This observation argues for continuing, rather than episodic, professional education.

The study has several limitations that merit consideration. The single-group pre-post design, undertaken without a concurrent control arm, limits the extent to which the observed gains can be attributed to the educational intervention alone rather than to other influences operating over the same period. Repeated exposure to an identical questionnaire may have produced a testing effect, in which familiarity with the items rather than genuine learning inflated post-intervention scores; recall of intervention content at the time of reassessment may similarly have shaped responses independent of any real change in underlying competence; and secular influences over the two-month follow-up, such as incidental professional exposure or discussion among peers, cannot be excluded as contributors to the improvement. Reassessment was carried out two months after the intervention, which permits some inference about short-term retention but leaves the durability of these gains beyond that window untested; a longer follow-up would be needed to establish

Table 1: Demographic profile of the study participants (n=70).

Variable	Category	n (%)
Age (years)	20-29	29 (41.4)
	30-39	21 (30.0)
	40-49	16 (22.9)
	50-59	2 (2.9)
	≥60	2 (2.9)
Gender	Male	64 (91.4)
	Female	6 (8.6)
Qualification	D.Pharm	40 (57.1)
	B.Pharm	29 (41.4)
	M.Pharm	1 (1.4)
Experience (years)	0-10	41 (58.6)
	11-20	16 (22.9)
	21-30	9 (12.9)
	≥31	4 (5.7)

Table 2: Pre- and post-intervention classification of knowledge, attitude and practice (n=70).

Domain	Category	Pre-intervention n (%)	Post-intervention n (%)
Knowledge	Good	35 (50.0)	68 (97.1)
	Poor	35 (50.0)	2 (2.9)
Attitude	Positive	53 (75.7)	69 (98.6)
	Negative	17 (24.3)	1 (1.4)
Practice	Safe	20 (28.6)	68 (97.1)
	Unsafe	50 (71.4)	2 (2.9)

Table 3: Item-wise correct responses before and after the educational intervention (n=70).

Item	Pre n (%)	Post n (%)
Knowledge: OTC medicines may be harmful in pregnancy	42 (60.0)	68 (97.1)
Knowledge: Topically applied medicines may be harmful	16 (22.9)	39 (55.7)
Knowledge: Herbal medicine contents may be harmful	21 (30.0)	40 (57.1)
Knowledge: Daily iron and folic acid is necessary	49 (70.0)	63 (90.0)
Knowledge: Daily calcium supplementation is necessary	37 (52.9)	63 (90.0)
Knowledge: Awareness of teratogens and their effects	15 (21.4)	53 (75.7)
Attitude: Confident in dispensing drugs in pregnancy	49 (70.0)	56 (80.0)
Attitude: All OTC drugs are not safe in pregnant women	34 (48.6)	58 (82.9)
Attitude: Extra caution required while dispensing	52 (74.3)	61 (87.1)
Practice: Consults a drug-information resource before dispensing	12 (17.1)	60 (85.7)
Practice: Regularly updates medication-safety knowledge	11 (15.7)	44 (62.9)

OTC: Over-the-Counter.

Table 4: Comparison of mean KAP scores before and after the educational intervention (paired t-test).

Domain	Pre (Mean±SD)	Post (Mean±SD)	Mean change	t value	p value
Knowledge	8.57±0.99	10.65±0.92	2.08	12.40	<0.001
Attitude	9.01±0.86	10.11±0.79	1.10	7.93	<0.001
Practice	7.81±1.07	10.14±0.95	2.33	13.60	<0.001

SD: Standard Deviation; d_f=69; paired t-test, p<0.05 considered significant.

whether the improvements are sustained. The sample was drawn from a single urban area, which may limit the generalisability of these findings to pharmacists practising in rural or other urban settings. Finally, the practice domain relied on self-report rather than direct observation of dispensing encounters: gains in reported practice may reflect a genuine shift in intended behaviour, a tendency toward socially desirable responding once the correct answers had just been taught, or both, and may not fully correspond to how pharmacists actually counsel or dispense in real consultations with pregnant women. Direct observation or standardised-patient methodology would be needed to confirm that the reported changes translate into observed practice. Notwithstanding these constraints, the consistency and statistical strength of the improvements across all three domains lend confidence to the central conclusion.

The practical implication is clear. Community pharmacists are willing and able to improve, but they need structured opportunities to do so. Embedding mandatory continuing pharmacy education-focused on the specific lacunae identified here-into routine professional development would be a proportionate and effective response.

CONCLUSION

Community pharmacists in this study began with substantial deficits in their knowledge, attitude and practice regarding medication safety during pregnancy, with poor knowledge translating into cautious yet uninformed dispensing behaviour. A short, structured, multimodal educational intervention produced statistically significant improvements across all three domains. These findings make a strong case for the routine incorporation of continuing pharmacy education, targeted at identified knowledge gaps, to strengthen the quality of medication counselling that pregnant women receive at the community level.

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ABBREVIATIONS

KAP: Knowledge, Attitude and Practice; **OTC:** Over-the-counter; **SD:** Standard deviation; **D.Pharm:** Diploma in Pharmacy; **B.Pharm:** Bachelor of Pharmacy; **M.Pharm:** Master of Pharmacy; **p:** Probability value; **n:** Frequency or sample size; **d_f:** Degrees of freedom; **IEC:** Institutional Ethics Committee; **t:** t-value.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL APPROVAL

Approved by the Institutional Ethics Committee, Hanagal Shri Kumareshwar College of Pharmacy, Bagalkote (Ref. No. HSKCOP/IEC/23/6, dated 21 March 2023).

AUTHORS CONTRIBUTIONS

AM, AB and SN conceived the study, collected and analysed the data, and drafted the manuscript. RSH supervised the work, guided the methodology and critically revised the manuscript. All authors approved the final version.

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