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Prioritizing intervention measures to prevent inappropriate self-medication practices using the Analytical Hierarchy Process

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ABSTRACT

Background: United Nations Sustainable Development Goal 3 outlines the target of reducing premature mortality from non-communicable diseases by one third through prevention and treatment by 2030. In low and middle-income countries (LMICs) like Nepal, a significant number of people do not have accessible and affordable healthcare services available to them, leading to self-medication practices (SMP). Limited numbers of health professionals, ineffective regulation and easy availability of prescription medicines encourage the use of inappropriate SMP, which could result in health risks.

Objectives: The objection of the study is to test the application of Analytical Hierarchy Process (AHP) for prioritizing the intervention measures for preventing inappropriate SMP.

Methods: The 25 experts were included in the study, out of which only 16 experts passed the consistency test. Data were collected using a structured questionnaire by the application of AHP model for ranking the intervention measures for preventing inappropriate SMP from March 2020 to May 2020. During this process, the purposively selected experts compared seven intervention measures based on three criteria: control use of prescription and non-prescription medicine, knowledge regarding the medicine and its use, and minimizing healthcare cost.

Result: The criteria, “control use of prescription and non-prescription medicine” was judged 3.58 times and 1.53 times more important than to “minimize the healthcare cost” and “knowledge regarding the medicine and its use” respectively. “Regulation of prescription and non-prescription dispensing practice” was the most prioritized intervention measure to prevent inappropriate SMP with a priority score of 20.68% followed by the “accessibility of healthcare system” (19.27%) and “awareness program for the consumers” (17.13%).

Conclusion: The AHP method can be used in decision-making related to prioritizing the intervention measures to prevent inappropriate SMP. Among the seven intervention measures considered, “regulation of prescription and non-prescription dispensing practice” was the most preferred intervention measure to improve SMP followed by “access to healthcare” and an “awareness program”.

1. Introduction

Globally, at least 400 million people have no basic health care and annually, 15 million people die prematurely from non-communicable diseases.¹ The United Nations has set 17 Sustainable Development Goals which includes Good Health and Well-being (Goal 3). Under this goal, the target of reducing by one third premature mortality from non-communicable diseases through prevention and treatment by 2030 is outlined.¹

In the case of developing countries, a significant number of people do not have accessible and affordable healthcare services² resulting in self-

medication practice (SMP).³ According to the World Health Organization (WHO), self-medication is define as “selection and use of medicines by individuals to treat self-recognized illnesses or symptoms.”⁴ The treatment selected by the consumers (i.e. patients, general population etc.) for self-medication may depend on the magnitude of the disease (mild or serious), type of medicine, socioeconomic status of the patient and cultural factors.^{5,6} Self-medication have established benefits as well as potential risks,³ the sole effectiveness of which depends on how rationally it is practiced. For example, problems with self-medication arise when patients practice it irrationally by using not only over-the-counter (OTC) medicines⁷ but also prescription-only-medicines (POM).⁸ This practice has led to serious

Abbreviations: SMP, Self-Medication Practices; AHP, Analytical Hierarchy Process; WHO, World Health Organization; OTC, Over-The-Counter; POM, Prescription-only-medicines; CI, Consistency Index; CR, consistency ratio; LMICs, low and middle-income countries.

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consequences like adverse effects leading to hospitalizations, drug interactions, antibiotic resistance, therapeutic failure, drug dependence, extended treatment periods or even death.⁹

A study conducted in a major city of Nepal reported a high prevalence rate of self-medication (45.2%) within the community; almost half the medicines used were POMs.¹⁰ The reason for this could be that in low and middle-income countries (LMICs) like Nepal, the pharmacy is the first place where consumers seek advice for common symptoms and other health related problems and have easy access to medicine/s.^{10,11} In Nepal, a large number of pharmacies are owned by the private sector with a tendency of being more profit than service oriented.¹² This may lead to irrational practice of using POMs as self-medication by consumers because of ease of access, being less time consuming and cheaper than consulting the physician.^{13,14}

Nepal has its own Drug Act 1978 and according to clause 17 only the physician should prescribe POMs, which should be dispensed by the pharmacy professionals.¹⁵ Practicing healthcare without a license is prohibited in Nepal.¹⁶ In practice, the implementation of strict regulation is challenging due to poor monitoring processes. In addition, private medicine sellers or retailers without having formal education can also practice medicine dispensing after undertaking training and obtaining a license to operate a pharmacy from the Department of Drug Administration (DDA) in the country.¹⁷ All these consequences may lead to an increase of SMP.

Hence, greater attention is needed towards SMP specially in developing country like Nepal. In this regard, many studies have identified several intervention measures to make SMP more responsible.^{18–20} Implementing all intervention measures together is always difficult due to the constraints of available resources, especially in developing countries. Choosing the best alternative among the available intervention measures becomes quite complex in the absence of evidence-based judgment. Under these conditions, the Analytical Hierarchical Process (AHP) can be a potential tool to decide which of the available options are more appropriate to be used to resolve the problem with SMP.

The AHP is a multi-criteria decision analysis tool, which was first developed in the 1970s by Saaty.²¹ The method is well adapted²² and frequently used for decision processes in the healthcare system where it allows input of quantitative and qualitative criteria into the decision process.²³ This method is a step-wise problem solving method where the decision-maker uses experts' opinions for solving a problem effectively and efficiently.^{24,25}

While using AHP decision model, development of decision model representing the system to be studied uses pairwise comparisons to find the comparative importance of criteria with respect to decision goal and prioritization of intervention options with respect to criteria.²³ Weighting approach is used for direct and indirect comparisons for getting combined numerical score in order to determined priority ranking.²³ Additionally, AHP reduces bias by measuring consistency of judgments, thereby establishing an acceptable level of tolerance for degree of inconsistency.^{26,27} The approach allows decision makers to make transparent judgments based on numerical scores²³ and use of small groups of related stakeholders for decision-making is considered as one of the advantages.²⁸

As SMP is multifaceted in nature based on several criteria, AHP is a suitable and appropriate choice to support the decision-making process^{22,29} through construction of a decision model for selecting the best alternative solutions for solving complex problems. In the present study, the AHP method was used in decision-making related to prioritizing the intervention measures to prevent inappropriate SMP.

2. Methodology

The study was conducted between March–May 2020 with 25 experts. A structured questionnaire for ranking the intervention measures for preventing inappropriate SMP was applied using the AHP model. During this process, the experts compared seven intervention measures based on three criteria: control use of prescription and non-prescription medicine, knowledge regarding the medicine and its use, and minimizing healthcare cost. The detail of the methodology is as follows:

2.1. Development of the AHP Model for self-medication analysis

The standard AHP method was used to define the decision goal, its criteria (objectives) and the intervention measures (alternatives) related to criteria for development of the AHP model. To develop the structure of the AHP model for self-medication analysis, a decision goal was considered at the topmost level, followed by the hierarchy consisting of decision criteria and alternative intervention measures. The study used three criteria and seven intervention measures based on the extensive literature review (details has been provided in S-file-1).^{20,30–44} The hierarchy used to prioritize intervention measures to control inappropriate SMP is shown in Fig. 1.

The goal was to choose the optimal intervention measure to prevent inappropriate SMP. The three criteria considered for analysis are as follows:

Control of prescription and non-prescription medicines: To prevent inappropriate SMP, it is important to have control over prescription and non-prescription medicine use by consumers. Irrational and uninformed use of medicines may lead to negative consequences such as antimicrobial resistance, drug abuse, drug dependence, adverse drug reaction, and drug interactions.^{9,40,42–44}

Knowledge regarding the medicine and its use: Inappropriate SMP is due to lack of knowledge about the medicine and its use.^{30,39,40} Regular educational interventions to consumers as well as health workers about medicine/s can help in changing attitudes and knowledge related to medicine and its use, thus preventing inappropriate practice. If consumers have basic biological and medical knowledge about the medicine then it could help in minimizing risks with SMP.^{31,40}

Minimizing the healthcare cost: Cost is one of the important factors for populations to practice self-medication since most patients from LMICs must bear the treatment cost from their own pocket.³²

The intervention measures chosen for the model were as follows:

Accessibility of healthcare system: Access to healthcare is an important intervention measure as it changes healthcare seeking behaviors that will help to prevent the potential risk.^{33,39–41,44}

Regulation of prescription and non-prescription dispensing practice: Strict regulation regarding dispensing is a key factor that needs to be addressed particularly in LMICs to minimize the potential risk of inappropriate SMP.^{20,44}

Capacity building programs for the pharmacist: Knowledge is an important factor to develop oneself and the community. Therefore, continuing education programs to healthcare workers regarding the rational use of medicines are beneficial for reducing the consequences of inappropriate SMP.^{37,43}

Awareness program for the consumers: Awareness regarding medicine use for consumers helps to prevent inappropriate SMP by making consumers more responsible towards the use of medicines.^{33,34,43}

Medicine counselling practice: Importance of medicine counselling practice has been well established.³⁵ This type of practice will support individuals in making proper health decisions and for long-term wellbeing.^{35–37,39,43}

Doctors-patient relationship: Good doctor-patient relationship could be one of the factors that may lead to the prevention of inappropriate SMP.^{38,43}

Provision of health insurance: Studies have shown that provision of health insurance may minimize the incidence of inappropriate SMP.^{18,32,39,41}

The above-mentioned intervention measures can be applied to prevent inappropriate SMP mostly in the case of developing countries.

2.2. Questionnaire preparation based on AHP model

After creating the hierarchy framework, a questionnaire was developed to enable pairwise comparison between all selection criteria and intervention measures. The pairwise comparison process elicits a qualitative judgment that indicates the strength of decision maker's preference in a specific comparison according to Satty's 1–9 scale.^{45,46} The questionnaire structure was focused on attaining the study goal through several pairwise comparisons related to criteria and intervention measures.

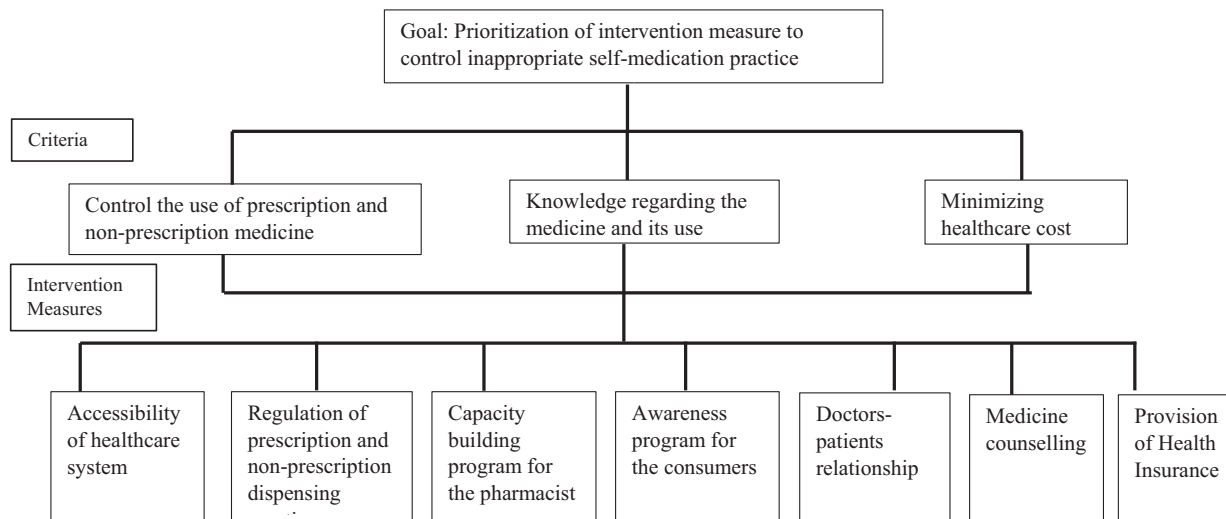


Fig. 1. The hierarchy used to prioritize intervention measures to control inappropriate SMP

2.3. Content and process validation in development of AHP Model and questionnaire

The developed questionnaire was circulated among selected expert participants after briefing them about the AHP model and the process. Three experts from different fields were chosen for the review and validation of the content and process used for the questionnaire development. The experts included a research scientist with more than three decades experience, and expertise in SMP, an academicians with 25 years' experience in teaching, learning activities and patient care, and a modeling expert who had experience using the AHP model.

2.4. Conduction of expert judgment survey

The detail conduction of expert judgment survey was conducted among 25 participants. The participants chosen for expert judgment had at least 10 years of experience in their respective fields. Study participants were from academic (physicians, pharmacologist, pharmacist) and research disciplines (epidemiologist, sociologist pharmacologist and pharmacist), clinicians (physicians, nurses, pharmacist) and regulatory bodies (pharmacologist and pharmacist). The reason for purposively selecting different participant from various fields was to obtain different viewpoints. The telephone and email communication were used for connecting and informing experts about the study. Written informed consent was obtained, with ethical approval from the Nepal Health Research Council (NHRC), Kathmandu Nepal (Reg. no. 519/2019).

2.5. Analysis of data using AHP for self-medication

The AHP Model was developed using a set of pair-wise comparison matrices in which criteria and intervention measures were compared. The comparison was made using the standard AHP 1–9 scale where “1” means both criteria were equally important and “9” means one criterion was absolutely more important than the other as shown in Table 1.^{45,46} Individual preferences were converted into ratio scale weights that generate linear additive weight for each alternative.

Based on the weight obtained, matrixes were formed, in which element of the matrix represents the relative importance of the criteria.^{23–25} If n is size of the matrix, there were n (n-1)/2 judgments required in developing the set of matrices. Hierarchical synthesis was utilized to weight the eigenvectors according to weights of the criteria. The summation was carried out for all weighted eigenvectors corresponding to those in the next lower hierarchy level. Finally, the logical consistency

Table 1
Pairwise comparison scale for AHP preferences^{45,46}.

Scale	Definition	Explanation
1	Equally important	Both objectives contribute equal importance
2	Weak or slightly important	
3	moderately important	Priority judgment slightly favor one objective over the other
4	Moderate plus	
5	strongly important	Priority judgment strongly favor one objective over the other
6	Strong plus	
7	Very strongly important	One objective is very strongly favored over the other
8	Very very strongly important	
9	Absolutely more important	The evidence favoring one objective over the other is of the highest possible order of affirmation

of expert judgment was calculated. The consistency was identified by using eigenvalue (λ_{max}) after all pairwise comparisons was calculated by using the formula for consistency index (CI) = $(\lambda_{max} - n)/(n-1)$ where n is the matrix size. The consistency of the judgment was checked by considering the consistency ratio (CR) of CI with appropriate value of random consistency index (RI) mentioned in Table 2. Saaty suggested that the judgment is consistent and acceptable when CR values does not exceed 0.10 and if its value is greater than 0.10, the judgment matrix was considered as inconsistent.^{25,45,47}

The priority of given intervention measures with respect to meeting criteria at next level up hierarchy was obtained by summing the product of weight for the measures with weight for the criteria. The standard AHP approach was used to compare the alternatives by considering the ratio with relative difference of 1.1 as significant.²³ Then priority vectors were analyzed and based on that, ranking of the intervention measures were made. In order to test sensitivity of priority weightage assigned to the criteria on an overall ranking of intervention measures, sensitivity analysis was carried out by assigning 100% priority weightage to single criteria over

Table 2
Average Random consistency index^{25, 45,47}.

Size of matrix	1	2	3	4	5	6	7	8	9	10
Random Consistency	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

other criteria at a time⁴⁸ The collected data were entered and analyzed by using Microsoft Excel 2013 version.

3. Results

To prioritize the intervention measures for SMP, 25 experts were involved in the study. Before conducting pairwise comparisons, inconsistency of criteria wise decision matrix was checked. Sixteen out of 25 experts passed the consistency test, where inconsistencies were taken as less than 10% (i.e., CR <10%), and remaining 9 experts were rejected. Therefore, the rate of expert participants involved in the study was 64%. Among the selected experts, 6 (37.5%) were from academic field, 5 (31.25%) were community pharmacists, 3 (18.75%) were from clinical practice and the remaining 2 (12.5%) were from regulatory bodies. Detail regarding the demographic characteristics of participants is shown in Table 3.

The global priority scores of all criteria and intervention measures to achieve the goal are listed in Table 4. Among the criteria judged by the experts, “control over the use of prescription and non-prescription medicine” scored the highest priority with 51.70%, followed by “knowledge regarding the medicine and its use” with a score of 33.86%, and third was “minimizing the cost of healthcare system” with 14.44%. To fulfill the above-mentioned criteria, seven intervention measures were considered (see Fig. 1).

Under the criteria consisting of “control the use of prescription and non-prescription medicines”, the intervention measure, “regulation of prescription and non-prescription medicine dispensing” scored the highest global priority score with 12.28%, followed by “accessibility of health care system” with the score of 10.82% and “awareness program for consumers” with 8.61%.

Similarly, for the second criteria: “knowledge regarding medicine and its use” the intervention measure “awareness program for consumers” scored the highest global priority score with 6.27%, followed by “medicine counseling practice” with the score of 6.08% and “regulation of prescription and non-prescription dispensing medicine dispensing” with the score of 5.98%.

In the case of the third criteria: “minimizing healthcare cost”, “accessibility of health care system” scored the highest global priority score with 2.73%, followed by “regulation of prescription and non-prescription medicine dispensing” with the score of 2.42% and “awareness program for consumers” with the score of 2.25%.

Control use of prescription and non-prescription medicines for SMP was judged 3.58 and 1.53 times more important than minimizing healthcare cost and knowledge regarding the medicine and its uses respectively (Table A in S file-2). Knowledge regarding the medicine and its use was judged 2.35 times more important than minimizing the cost of the healthcare system. This confirms that controlling the use of prescription

Table 3
Socio-demographic characteristics of Experts participants.

Demographic Characteristics	Frequency	Percentage (%)
Gender		
Male	10	62.5
Female	6	37.5
Faculty		
Medical Doctor	3	18.75
Community Pharmacist	5	31.25
Academician	6	37.5
Regulatory body	2	12.5
Education level		
PhD	3	18.75
Post graduate	12	75
Undergraduate	1	6.25
Years of experience		
(11–15)	8	50
(16–20)	5	31.25
20 above	3	18.75

Table 4
Global priority scores of criteria and intervention measures.

Criteria	Global Priority score, %
Control use of prescription and non-prescription medicine (criteria)	51.70
Regulation of prescription and non-prescription dispensing practice	12.28
Accessibility of healthcare system	10.82
Awareness program for the consumers	8.61
Capacity building program for the pharmacist	7.22
Medicine counselling	6.58
Doctor-patient relationship	4.53
Provision of Health Insurance	1.65
Knowledge regarding the medicine and its use (criteria)	33.86
Awareness program for the consumers	6.27
Medicine counselling	6.08
Regulation of prescription and non-prescription dispensing practice	5.98
Accessibility of healthcare system	5.71
Capacity building program for the pharmacist	5.37
Doctors-patients relationship	2.90
Provision of Health Insurance	1.56
Minimizing healthcare cost (criteria)	14.44
Accessibility of healthcare system	2.73
Regulation of prescription and non-prescription dispensing practice	2.42
Awareness program for the consumers	2.25
Capacity building program for the pharmacist	1.90
Medicine counselling	1.80
Doctors-patients relationship	1.73
Provision of Health Insurance	1.61

and non-prescription medicines was significantly more important than all other criteria, as judged by the experts, for preventing inappropriate SMP.

The priority scores for intervention measures showed that “regulation of prescription and non-prescription dispensing practices” was the preferred intervention measure to be considered to improve SMP followed by “access to healthcare” and “awareness program” as shown in Fig. 2. The overall relative differences between the intervention measures are listed in Table 5, which also shows the preferred alternative was “regulation of prescription and non-prescription dispensing practice”. When it was compared with the other alternatives, the difference was greater than 1.1 which indicates “regulation of prescription and non-prescription dispensing practice” was preferred significantly. Similarly, access to healthcare, awareness program and medication-counselling practice were also significantly preferred by experts.

The priorities for each intervention measure meeting individual objective are given in Table B in S file-2. The relative difference between alternatives are outlined in Tables C-E in S file-2.

The relative differences between intervention measures under the criteria “control of prescription and non-prescription medicine use” (Table C in S file-2), showed that “regulation of prescription and non-prescription medicine dispensing” was the preferred intervention measure over all other interventions with the high weightage value ranging from 1.44 to 4.56.

Likewise, for the criteria “knowledge regarding the medicine and its use” in Table D in S file-2, two intervention measures namely “regulation of prescription and non-prescription medicine dispensing” and “awareness program to the consumers” were equally preferred with relative difference ranging from 1.13 to 2.81.

The relative differences between intervention measures for “minimizing health care cost” in which “regulation of prescription and non-prescription dispensing practice” and “access to the healthcare system” were significantly preferred as compared to other measures with the relative difference ranging from 1.19 to 1.44 and 1.12 to 1.35 respectively (Table E in S file-2).

In order to test the sensitivity of the priority weightage assigned to a criterion on overall ranking of the intervention measures, a sensitivity analysis was carried out. The sensitivity analysis was carried out with 100% prioritizing “control the use of prescription and non-prescription medicine use” (weights: 100%) over “knowledge regarding the medicine and its use” (weights: 0%) and “minimizing healthcare cost” (weights: 0%). The result

Priority Score

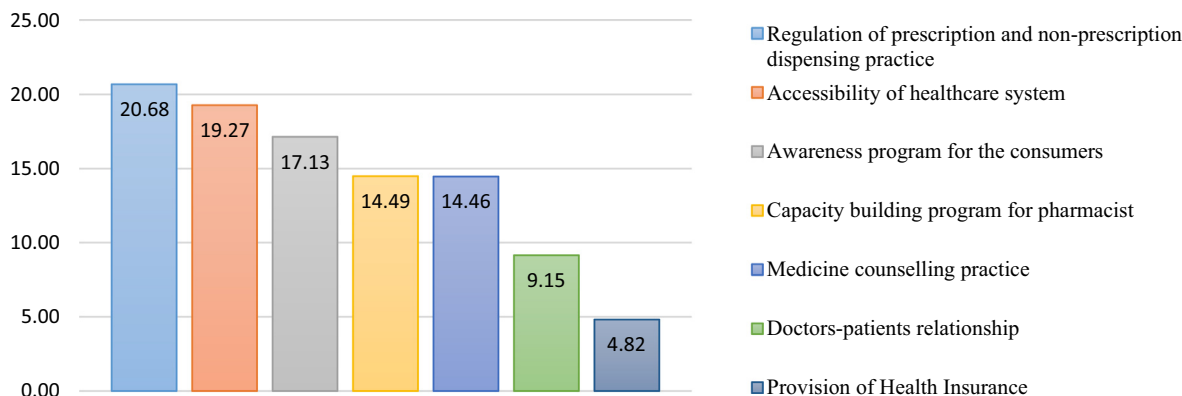


Fig. 2. Priority score for overall intervention measures

Table 5

Overall relative difference between the intervention measures #.

Alternatives	Regulation of prescription and non-prescription dispensing practice	Accessibility of healthcare system	Awareness program for consumers	Capacity building program for pharmacist	Medicine counselling practices	Doctors-patients relationship	Provision of Health Insurance
Regulation of prescription and non-prescription dispensing practice	1.00	1.28	1.38	1.82	1.55	1.93	3.48
Accessibility of healthcare system		1.00	1.07	1.39	1.20	1.53	2.65
Awareness program for the consumers			1.00	1.28	1.12	1.48	2.49
Capacity building program for pharmacist				1.00	0.88	1.20	1.96
Medicine counselling practice					1.00	1.32	2.23
Doctors-patients relationship						1.00	1.76
Provision of Health Insurance							1.00

Relative difference is calculated by multiplying the global priority score Table 3 and the relative difference between the intervention alternatives regards to the individual objectives Table A, B, C in S file (relative difference for Regulation of prescription and non-prescription dispensing practice versus Accessibility of healthcare system is $((1.44*51.70 + 1.13*33.86 + 1.06*14.44)/100 = 1.28)$).

showed that there was no change in the ranking of the intervention measures. While assigning maximum weight to the “knowledge regarding the medicine and its use” (weights: 100%) over “control the use of prescription and non-prescription medicine use” (weights: 0%) and “minimizing healthcare cost” (weights: 0%), the result showed change in the ranking with “awareness program for consumers” preferred most followed by “medicine counselling” and “regulation of prescription and nonprescription dispensing practice”. Finally, by giving 100% weightage to the “minimizing healthcare cost” (weights: 100%) as compared to “control use of prescription and non-prescription medicine use” (weights: 0%) and “knowledge regarding the medicine and its use” (weights: 0%), the preferred ranking was “accessibility of healthcare system” followed by “regulation of prescription and non-prescription medicine”. The result shows that the selection of the top three prioritized intervention measures is insensitive to the weightage assigned to the individual criteria. Therefore, the overall ranking of the intervention measures from this study have shown that “regulation of prescription medicine and non-prescription medicine”, “accessibility of healthcare

system” and “awareness program for the consumers” are the three most preferred intervention measures for improving and minimizing SMP. Table 6 shows the detailed ranking of the intervention measures for SMP.

4. Discussion

In the current study, the authors demonstrated the use of the AHP method to support the decision-making process in selecting and prioritizing the intervention measures to prevent inappropriate SMP in a more transparent and evidence-based manner. Although this method has been applied in other areas of healthcare such as prioritizing treatment modules,^{23,27} regulatory science⁴⁹ and in other healthcare related decision-making contexts,³⁰ to the authors' knowledge, the AHP method has not been used before for the prioritization of intervention measures for preventing inappropriate SMP..

Among the seven intervention measures listed in the study (Fig. 1), the highest priority score of 20.68% was given to the regulation of prescription and non-prescription dispensing practice. Lack of legislation and poor

Table 6

Sensitivity analysis of the priority weightage assigned.

	Actual ranking	Control the use of prescription and non-prescription medicine is 100%	Knowledge regarding the medicine and its use is 100%	Minimizing healthcare cost is 100%
Regulation of prescription and non-prescription dispensing practice	0.21	0.24	0.18	0.17
Accessibility of healthcare system	0.19	0.21	0.17	0.19
Awareness program for the consumers	0.17	0.17	0.19	0.16
Capacity building program for pharmacist	0.14	0.14	0.16	0.13
Medicine counselling practice	0.14	0.13	0.18	0.12
Doctors-patients relationship	0.09	0.09	0.09	0.12
Provision of Health Insurance	0.05	0.03	0.05	0.11

enforcement mechanisms regarding unauthorized dispensing practices may encourage irrational self-medication. Hence, to prevent inappropriate SMP, the government should consider implementing strict regulation of medicine dispensing practice for both OTCs and POMs, which are lacking in developing countries like Nepal.⁵⁰ A study conducted in China had reported that implementation of strict regulations regarding the rational use of medicine reduced overall use of medicines by consumers.⁵¹

The second highest priority score was given to accessibility of the healthcare system (19.27%). In Nepal, only 61.8% of the population have access to healthcare within 30 min.⁵² This indicated that a significant percentage of the population are deprived of access to health care service which might lead to irrational SMP resulting in serious consequences.^{53,54} The third highest priority score 17.13% was given to the awareness program for consumers. A study conducted in Indonesia showed that SMP was improved if education and training programs to the community are conducted regularly.²⁰ The studies conducted in Ethiopia and Nigeria have reported that community awareness is one of the important factors for responsible self-medication.^{55,56} Marak et al.⁵⁷ also mentioned in their study that education regarding responsible SMP to the general population should be one of the many intervention measures considered.

In the fourth and fifth priority, the experts selected a capacity building program for the pharmacist (14.49%) and medicine counselling (14.46%) respectively. A capacity building program allows updating the professional skills that may be helpful in promoting rational use of medicine. Counselling regarding use of medicine not only improves adherence to the current treatment but also allows the patient to make proper health decisions.³⁸ Most patients usually avoid visiting doctors frequently either because of fear regarding their health issues or due to a communication gap between them or due to lack of access to healthcare services.^{44,58} Therefore, often patients have to rely on friends, family and even pharmacy store without qualified pharmacist for their health issues, which may result in SMP specially in developing country like Nepal.³⁸ Hence, if doctor-patient relationship is improved, it may help to minimize SMP.³⁸

Provision of health insurance in the country can also reduce SMP. In Mexico, a study shows socioeconomic status was one of the reasons for SMP; the population with access to health insurance used less SMP compared to people without access to a health insurance service.³¹

Based on the above findings, in order to prevent inappropriate SMP in Nepal, the policy maker should focus on developing effective institutional mechanism for monitoring and regulating proper dispensing practices, developing proper healthcare facilities based on population and geographical distribution, conduct awareness program for consumers, regular capacity building and upgrading for the health professionals and introduction of mandatory health insurance on the long run.

4.1. Limitations of the study

This study has considered three criteria and seven intervention measures for preventing inappropriate SMP by using the AHP. However, it did not undertake a systematic review approach to inform the questionnaire and further studies should be conducted to consider other additional criteria and intervention measures. This study is an attempt to use the AHP process for prioritization of intervention measures to prevent inappropriate SMP for Nepal and the results cannot be generalized to other places where different socio-economic conditions exist.

5. Conclusion

In the case of developing countries, a significant percentage of the population lack accessible and affordable healthcare service which can result in SMP and related health hazards. This study demonstrated that the AHP can be used as an effective tool for the decision-making process to prioritize the intervention measures to prevent inappropriate SMP.

This process helps the decision maker to understand the importance of different components in the decision process and prioritize intervention

measures by incorporating all the determinants of the decision to achieve a goal.

The study shows that among the seven intervention measures “regulation of prescription and non-prescription dispensing practice” was the most preferred intervention measure to be considered to improve SMP followed by “access to healthcare” and an “awareness program”.

Ethics approval and consent to participate

Ethical clearance of the protocol was obtained from the Nepal Health Research Council (NHRC), Kathmandu Nepal (Reg. no. 519/2019). The participants were informed regarding the purpose of the study. Written informed consent were taken from all expert participants who participated in the study.

Consent for publication

Not applicable.

Availability of data and materials

The data entered and analyzed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions

All authors contributed to the conception and design of the study and OB analyzed and interpreted the data and drafted the manuscript. All authors reviewed and approved the final manuscript for publication.

Declaration of Competing Interest

Not applicable.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rcsop.2022.100117>.

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