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Implementation of the Smart Method in Selection of Contraceptive Devices in Couples of Childbearing Age Case Study: Datar City Health Center

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Abstract

In a marriage, the presence of a child is something that is desired. The Indonesian government, in particular, the National Population and Family Planning Agency (BKKBN) advises husband and wife couples to have a maximum of 2 children. One way to plan the number and timing of pregnancies is to use contraception. This research implements the SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) Method in the selection of contraceptives for couples of reproductive age at the Kota Datar Health Center. The results obtained from the research conducted show that the SMART method used in this system has been proven to be effective in helping select contraceptives for couples of childbearing age in the Datar City Community Health Center case study, because it can select alternatives and carry out rankings in determining the right contraceptive for couples of childbearing age. according to needs based on predetermined criteria, where the injection alternative (A04) with a final score of 83 is a suitable contraceptive for couples of childbearing age according to their needs.

Keywords: *Contraceptive Selection, Reproductive Age Couples, SMART*

1. Introduction

In a marriage, the presence of a child is something that is desired. The Indonesian government, in particular, the National Population and Family Planning Agency (BKKBN) advises husband and wife couples to have a maximum of 2 children. One way to plan the number and timing of pregnancies is to use contraception. Currently, various types of family planning (KB) contraception are available, such as MOW, MOP, IUD, implants, injections, pills and condoms. These types of contraceptives have advantages and side effects, not all of which are suitable for every individual [1].

The Community Health Center (Puskesmas) is a First Level Health facility which is responsible for public health in the sub-district area. Puskesmas has been approved as a public health service unit that provides healing and preventive services , comprehensive and easy to reach within the sub-district working area. In an effort to improve services for family planning (KB) which is being promoted by the government, Datar City Puskesmas provides special services to people who wish to consult or use contraception [2].

During the family planning consultation process or choosing a contraceptive device, many family planning acceptors are not confident in choosing a contraceptive device. Therefore, it is important to know the effectiveness of each contraceptive device so that it suits the needs of the acceptor. Usually the acceptor chooses the contraceptive method that is easiest to use, even though the device does not necessarily suit the acceptor's needs and conditions, thus causing problems in choosing a contraceptive device and resulting in the failure of the family planning program.

2. Research Methodology

2.1. Decision Support Systems

A decision support system is part of a computer-based, knowledge-based and management information system that is able to support decision making in an organization or company. According to [3] *Decision Support System* (DSS) or decision support system is intended to support managerial decision makers in semi-structured and structured decision situations.

According to [4] decision support systems are one type of system that is very popular among company management, namely Decision Support Systems. This Decision Support System is information that is expected to help management in the decision making process

2.2. Smart Method

According to [4] SMART is a multi-attribute decision making method. This technique can help you choose several alternatives. Each alternative consists of a set of attributes and each attribute has values, and these values are averaged on a certain scale. Each attribute has a weight that describes how important it is compared to other attributes. Attribute weighting in SMART has two steps, namely [5], [6], [7], [8]:

1. Order the importance of an attribute from worst level to best level.
2. Make a comparison of the importance ratio of each attribute with other attributes below it.
   SMART is more widely used because of its simplicity in responding

The decision maker's needs and how he analyzes responses. The analysis involved is transparent so that this method provides a high level of understanding of the problem and can be accepted by decision makers. The weighting in SMART uses a scale between 0 and 1, seen in equation (2.1) to make it easier to calculate and compare the values for each alternative.
Models used in SMART :

$$u(a1) = \sum_{j=1}^{m} \text{wj ui } (a1), i = 1,2 \dots \text{m} \quad (2.1)$$

Information :
Wj = weighting value of the jth criterion and k criteria

U($a1$) = utility value of the ith criterion for the ith criterion

3. Results and Discussion

3.1. Research methods

In this research, the system being analyzed is the process of determining the choice of contraceptives for couples of childbearing age at the Datar City Health Center using the SMART method . The SMART method is an abbreviation of Specific , Measurable , Achievable , Relevant , and Time - bound . This method is used to assist in the process of making intelligent and planned decisions [9], [10], [11], [12].

The aim of this system is to suppress and control population growth by ensuring that couples of childbearing age can make the right choice of contraceptives.

3.2. Research Supporting Data

Table 1 Data on Family Planning Acceptors in Flat City Village

No	Name	Address	Age (Years)	A. K	Health (%)	Outcome Effects (%)
1	Dyah Ayu Utami	Hamlet I Giggled	27	Inject	71	93
2	Devi Kartikasari	Hamlet Viii Waringin	19	Inject	77	93
3	Adelin Pricillia Ayundi	Hamlet Xv Bakaran Batu	33	Implant	88	95
4	Rani Augustin	Hamlet X Batang Belo	24	Inject	77	93
5	Dea Aprilliani	Hamlet I Giggled	19	Inject	79	93
6	Dinda Anistya	Hamlet I Giggled	31	Pill	87	91
7	Chindy Novitaria Kristianty	Hamlet Iv Kupang	31	Pill	86	91
8	Adelin Pricillia Ayundi	Hamlet Xiv Gudanag Roof	22	Inject	74	93
9	Annisa Tiara Liani	Hamlet V Village Office Environment	28	Pill	83	91
10	Anisya Nursyah Gusman	Hamlet Xv Bakaran Batu	34	Implant	82	95
11	Dhea Amelia Yusrina Arsyi Sukarno	Hamlet V Village Office Environment	26	Inject	78	93
12	Dewi Risma Wati	Hamlet Iv Kupang	21	Inject	80	93
13	Tiara Hall	Hamlet Xii Rooftop Warehouse	23	Inject	71	93
14	Anisa Ayu Widiyanty	Hamlet Xi Lori	27	Inject	71	93
15	Anisa Erinda Sari	Hamlet Xv Bakaran Batu	29	Pill	77	91
16	Dea Aprilianti	Hamlet Iv Kupang	26	Inject	73	93
17	Goddess Septia	Hamlet Xiii Rooftop Warehouse	21	Inject	70	93
18	Astini Mega Sari	Hamlet Xiii Rooftop Warehouse	32	Implant	90	95
19	Anggraini Kusumo Octaviyanti	Hamlet Xiii Rooftop Warehouse	21	Inject	79	93
20	Desy Wijayanti Hayuningtyas	Hamlet Ix Paret Tuan	36	Implant	84	95
21	Chintia Wulfa Anugra	Hamlet Ii Giggled	31	Pill	71	91
22	Anita Dwi Lestari	Hamlet Ii Giggled	21	Inject	77	93
23	Anisa	Hamlet Iii Kupang	20	Inject	80	93
24	Dyah Mustika Elmastuti	Hamlet Xiii Rooftop Warehouse	23	Inject	75	93
25	Dea Fitroh Chaerunissa	Hamlet Xiv Gudanag Roof	27	Inject	71	93
26	Devi Puspita Sari	Hamlet Viii Waringin	23	Inject	74	93
27	Annisa Ulfa	Hamlet Xiii Rooftop Warehouse	26	Inject	78	93
28	Dea Hamar Novaliani	Hamlet Ix Paret Tuan	31	Pill	77	91

29	Atika Erdyah Safitri	Hamlet I Giggled	31	Pill	76	91
30	Apriliyanti Astuti	Hamlet V Village Office Environment	19	Inject	73	93
31	Dessy Retamia Magnatica	Hamlet Iv Kupang	19	Inject	79	93
32	Asrari Zikran Asnawi	Hamlet Iii Kupang	23	Inject	75	93
33	Anisa Dwi Jayanti	Hamlet Vii Waringin	26	Inject	78	93
34	Dini Hanifah	Hamlet Xi Lori	23	Inject	77	93
35	Adhika Dwita Dibyareswati	Hamlet Xiv Gudanag Roof	29	Pill	86	91
36	Anisa Permata Sari	Hamlet I Giggled	24	Inject	77	93
37	Dewi Wulandari	Hamlet Xiii Rooftop Warehouse	19	Inject	79	93
38	Annisa Ulfa	Hamlet Vii Waringin	27	Inject	71	93
39	Dini Syahputri	Hamlet Xii Rooftop Warehouse	21	Inject	74	93
40	Ayunabilla Holy Pratiwi	Hamlet Viii Waringin	31	Pill	78	91
41	Adhisti Tsaqolain	Hamlet Xiv Gudanag Roof	22	Inject	76	93
42	Angun Yesita Sari	Hamlet X Batang Belo	19	Inject	74	93
43	Dewi Maulidia	Hamlet Xiv Gudanag Roof	30	Pill	70	91
44	Athina Prima Sari	Hamlet Xii Rooftop Warehouse	23	Inject	77	93
45	Azizah Maulida	Hamlet I Giggled	24	Inject	73	93
46	Eka Ratna Sari	Hamlet Vii Waringin	26	Inject	77	93
47	Dewi Maulidia	Hamlet Ii Giggled	28	Pill	78	91
48	Diah Afri Wardani	Hamlet Xiii Rooftop Warehouse	24	Inject	79	93
49	Elmaria Br Ginting	Hamlet I Giggled	19	Inject	71	93
50	Dwi Wardhany's Image	Hamlet Xiii Rooftop Warehouse	21	Inject	75	93

3.3. Application of the Smart Method

In applying the SMART Method, there are several alternatives that need to be considered. Each alternative has relevant criteria and sub-criteria that need to be assessed. Apart from that, each subcriteria also has a utility value that must be determined. All the weights of the criteria and sub-criteria are then added up to get the total weight which will be adjusted to the suitability rating data.
The following is the suitability rating data taken from the Datar City Health Center:

Table 2 Match Rating Data

Alternative	Price	Health	Age	History	Yield effect	Period
MOW	> Rp. 1,500,000	90% - 100%	32 - 41	Normal	98%-99%	Permanent
IUD	Rp.1,000,000–Rp. 1,500,000	80% - 90%	36 - 41	Normal	96%-97%	1825 days
Implant	Rp. 100,000 – Rp. 900,000	80% - 90%	32 - 38	Irregular	94%-95%	1095 days
Inject	Rp. 50,000 – Rp. 100,000	70% - 80%	19 - 27	Irregular	92%-93%	90 days
Pill	Rp. 0 – Rp. 50,000	70% - 90%	28 - 31	Normal	90%-91%	Every day

1. utility value, and total weight:

Table 3 Alternatives

Alternative (A)	Information
A01	MOW
A02	IUD
A03	Implant
A04	Inject
A05	Pill

utility values , and weights are determined in the analysis for making decisions on selecting contraceptives for couples of childbearing age . Utility value are given on a scale of 0-100 to describe preferences for sub-criteria.

Table 4 Criteria, Sub-criteria and weights

No	Criteria	Utility Value		Weight
1	Price	Sub-criteria	Mark	Weight
	> Rp. 1,500,000	Very high	100	10%
	Rp. 1,000,000 – Rp. 1,500,000	Tall	80	
	Rp. 100,000 – Rp. 900,000	Currently	60	
	Rp. 50,000 – Rp. 100,000	Low	40	
	Rp. 0 – Rp. 50,000	Very low	20	
2	Health	Sub-criteria	Mark	Weight
	90% - 100%	Very high	100	15%
	80% - 90%	Tall	80	
	80% - 90%	Currently	60	
	70% - 80%	Low	40	
	70% - 90%	Very low	20	
3	Age	Sub-criteria	Mark	Weight
	32 – 41	Very high	100	15%
	36 – 41	Very high	100	
	32 – 38	Tall	80	

	19 – 27	Very low	20	
	28 – 31	Low	40	
4	Menstrual History	Sub-criteria	Mark	Weight
	Normal	Very high	100	15%
	Normal	Very high	100	
	Irregular	Currently	60	
	Irregular	Currently	60	
	Normal	Very high	100	
5	Outcome Effect	Sub-criteria	Mark	Weight
	98-99%	Very high	100	20%
	96-97%	Tall	80	
	94-95%	Currently	60	
	92-93%	Currently	60	
	90-91%	Low	40	
6	Period	Sub-criteria	Mark	Weight
	Permanent	Very high	100	25%
	1825 days	Tall	80	
	1095 days	Currently	60	
	90 days	Low	40	
	Every day	Very low	20	

2. Criteria Weight Normalization

   Normalization= $\frac{wj}{\sum wj}$

After getting the weights for each criterion, the next step is to normalize. Normalization is carried out by dividing the weight of the criteria obtained by the total weight of all existing criteria.

The process of normalizing the weight of each criterion in determining the decision to select contraceptives for couples of childbearing age at Datar City Health Center is as follows:

a. Price = $\frac{10}{100}$= 0.1
b. Health = $\frac{15}{100}$= 0.15
c. Age = $\frac{15}{100}$= 0.15
d. Menstrual history = $\frac{15}{100}$= 0.15
e. Yield effect = $\frac{20}{100}$= 0.2
f. Term = $\frac{25}{100}$= 0.25

Table 5 Weight Normalization Criteria

Criteria	Name	Weight Normalization
K01	Price	10% = 0.10
K02	Health	15% = 0.15
K03	Age	15% = 0.15
K04	Menstrual History	15% = 0.15
K05	Outcome Effect	20% = 0.20
K06	Period	25% = 0.25

3. Providing a Utility Value for each of the criteria that has been determined will be determined by analysis to determine the utility development value on a scale of 0-100.
4. Calculating the weighted utility value

   Calculate the weight of the Utility value using the following formula:

   ui (ai) =$100\frac{(Cout-Cmin)}{(Cmax-Cmin)}$

   The process of calculating the utility value in determining the decision to select contraceptives for couples of childbearing age (case study: Datar City Health Center)

   Utility Value =$100\frac{(5-1)}{(5-1)}\% = 100\frac{(4)}{(4)}\% = 100(1\%)$

   utility values have been entered according to the actual contraceptive assessment values in the table below:

Table 6 Value Matching Matrixs

No	Alternative	K01	K02	K03	K04	K05	K06
1	A01	100	100	40	20	100	20
2	A02	80	100	60	60	100	40
3	A03	80	100	60	60	100	60
4	A04	40	60	100	100	100	80
5	A05	20	80	100	100	40	80

5. Calculate Final value

   Calculate the final value with the following formula:

   ui (ai) =$\sum_{j=1}^{m} wjui\ (ai)$

After the value weights are normalized, the next step is to multiply the value by the utility value. Then, these values will be sorted (ranked) to get the final ranking.

The process of calculating the final value in determining the decision to select contraceptives for couples of childbearing age at Datar City Health Center is as follows:

A1 = (0.10 * 100) + (0.15 * 100) + (0.15 * 40) + (0.15 * 20) + (0.20 * 100) + (0.25 * 20)
= (10) + (15) + (6) + (3) + (20) + (5)
= 59
A2 = (0.10 * 80) + (0.15 * 100) + (0.15 * 60) + (0.15 * 60) + (0.20 * 100) + (0.25 * 40)
= (8) + (15) + (9) + (9) + (20) + (10)
= 71
A3 = (0.10 * 80) + (0.15 * 100) + (0.15 * 60) + (0.15 * 60) + (0.20 * 100) + (0.25 * 60)
= (8) + (15) + (9) + (9) + (20) + (15)
= 76
A4 = (0.10 * 40) + (0.15 * 60) + (0.15 * 100) + (0.15 * 100) + (0.20 * 100) + (0.25 * 80)
= (4) + (9) + (15) + (15) + (20) + (20)
= 83
A5 = (0.10 * 20) + (0.15 * 80) + (0.15 * 100) + (0.15 * 100) + (0.20 * 40) + (0.25 * 80)
= (2) + (12) + (15) + (15) + (8) + (20)
= 72

Table 7 Ranking Results

Alternative (Contraception)	Final score	Rank
Inject	83	1
Implant	76	2
Pill	72	3
IUD	71	4
MOW	59	5

Thus, injectable contraceptives received the highest ranking with a final score of 83, while MOW received the lowest ranking with a final score of 59, because in terms of price, injectable contraceptives are classified as moderate or affordable among acceptors. The right choice of contraceptive depends on individual needs and preferences.

4. Discussion Program

Below is a summary of the expert system design for the process of selecting contraceptives for couples of childbearing age in the Datar City Community Health Center case study. In the next section, we will discuss the visualization elements of the interface.

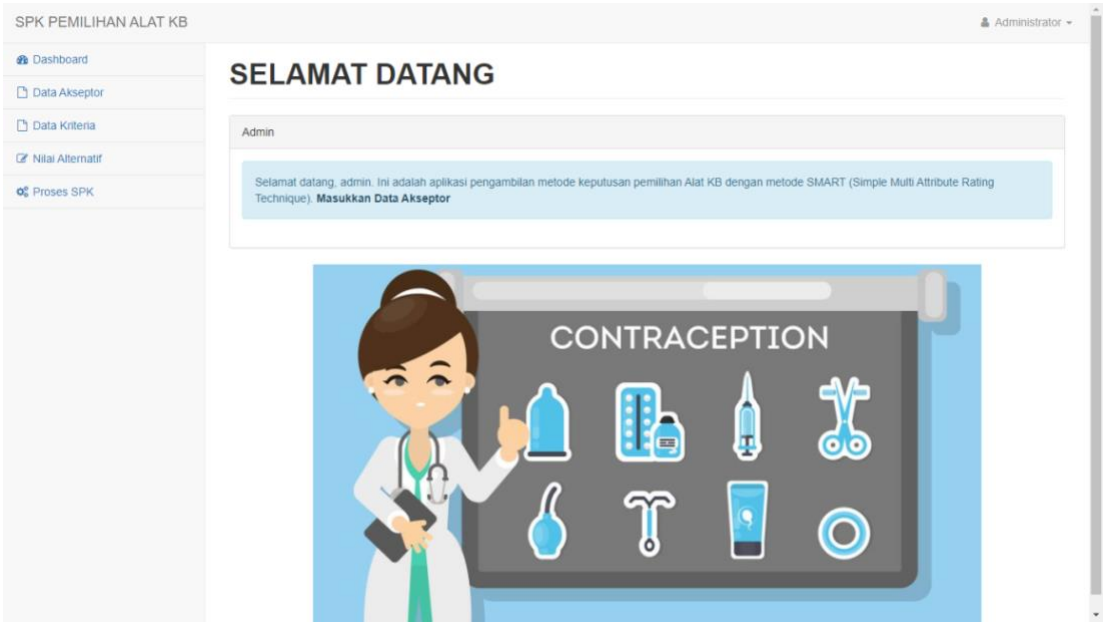

Figure 1 Dashboard Menu Display

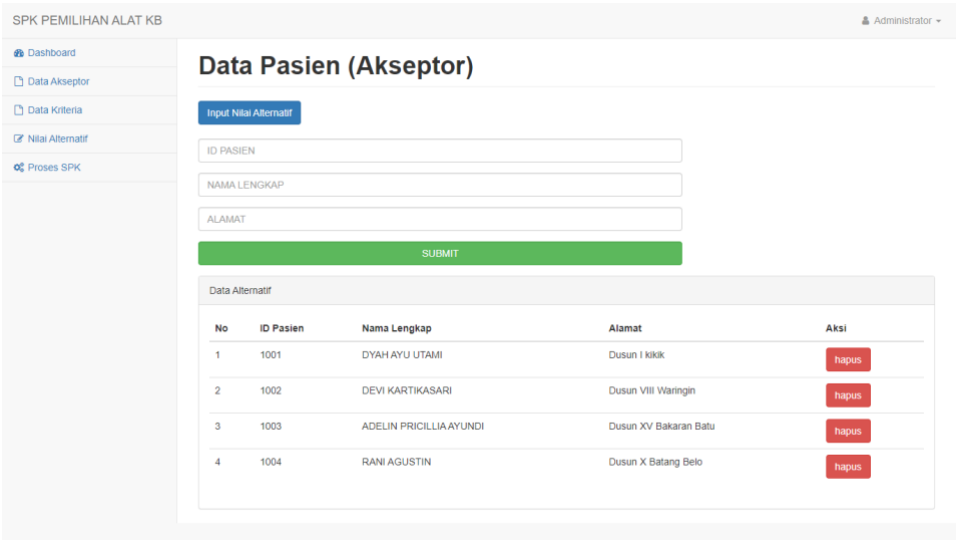

Figure 2 Data Acceptor Menu Display

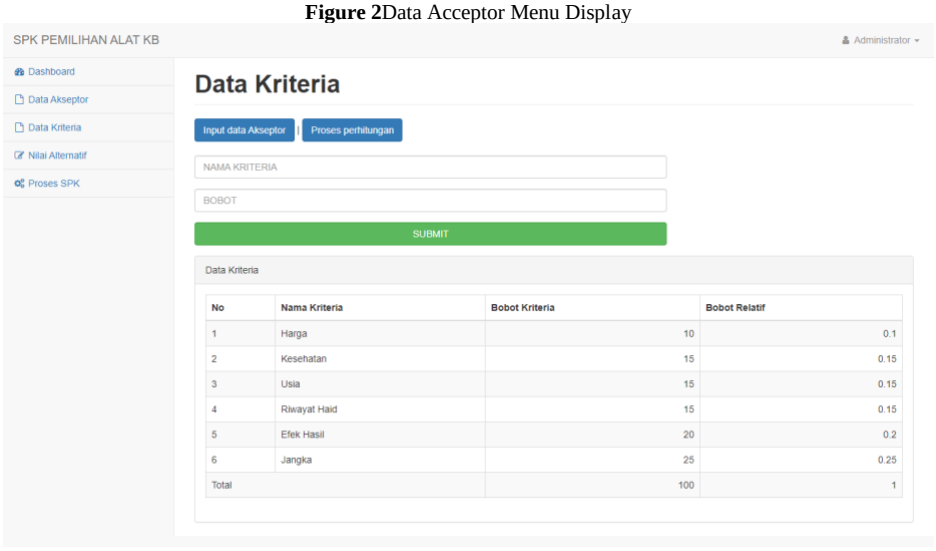

Figure 3: Criteria Data Menu Display

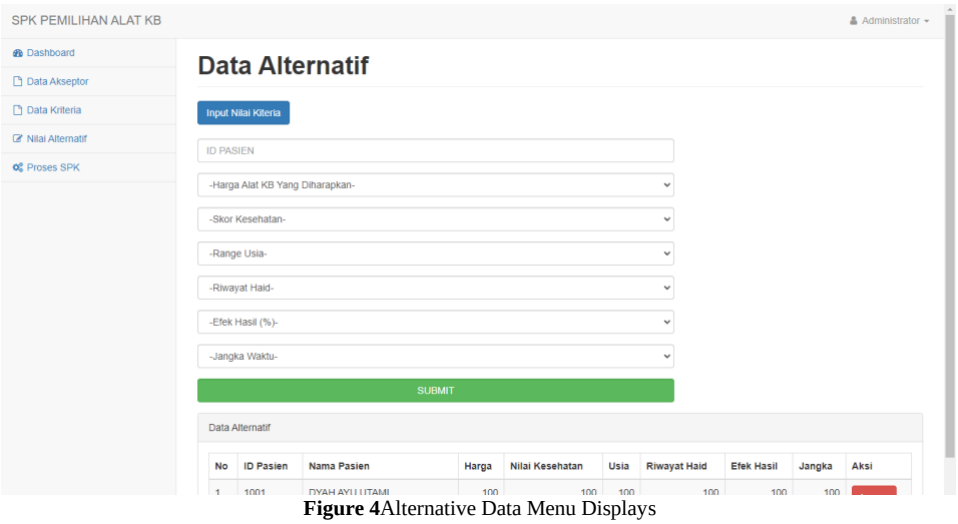

Figure 4 Alternative Data Menu Displays

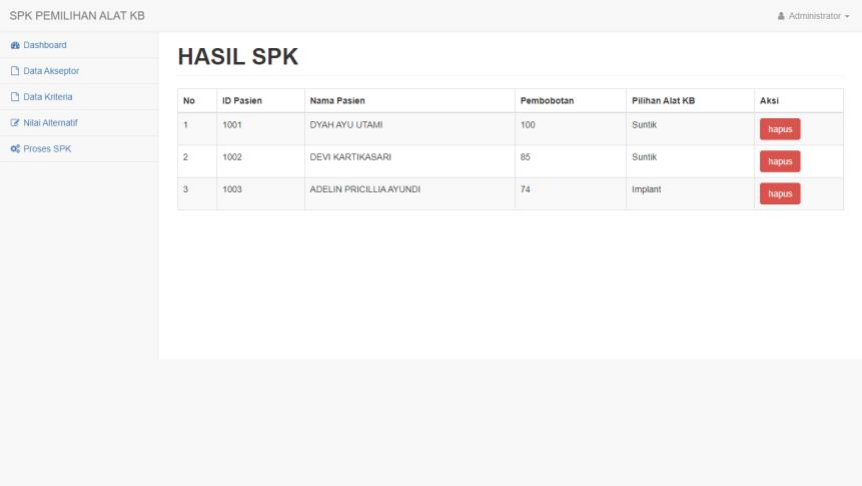

Figure 5: SPK Process Menu Display

5. Conclusion

Conclusions from the results of research, system analysis, design and testing of the contraceptive selection system for couples of childbearing age in the Datar City Community Health Center case study are as follows:

1. By implementing the SMART Method, the process of selecting contraceptives for couples of childbearing age at the Datar City Health Center becomes easier. This system makes it easy for couples of childbearing age to choose appropriate contraceptives based on an assessment of the weight of criteria and alternatives provided by the acceptor. This produces accurate recommendations for the appropriate use of contraception according to the couple's needs.
2. The SMART method used in this system has proven to be effective in helping select contraceptives for couples of childbearing age in the Datar City Community Health Center case study, because it can build a decision support system to be able to determine the right contraceptive for couples of childbearing age.

Suggestions

The suggestions in this research can be seen as follows:

1. For further research, more testing is needed to find the most accurate values or data for comparison using many methods other than the SMART method.
2. Future research is expected to increase the criteria used and adapt them to the needs and objectives of the system

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