Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th October 2025. Vol. 5. No. 1; e-ISSN: 2808-4519

The Application of A Priori Algorithms in Determining the Relationship Between Maternal Age and Pregnancy Condition

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Abstract

Pregnancy is an important phase in a woman's life that can affect the condition of the pregnancy, including the age of the mother. The age of the mother during pregnancy is often associated with certain complications, such as premature birth, preeclampsia, and fetal development disorders. Based on health data, women who are too young or too old are more likely to experience complications such as bleeding, hypertension during pregnancy, and infections during pregnancy compared to women of ideal reproductive age (20–35 years). Dr. Edward Binjai Clinic is one of the health facilities that provides services to pregnant women, including monitoring pregnancy conditions and treating complications. Until now, medical personnel at the clinic have treated patients based on experience and general protocols without a system that automatically analyzes historical patient data to find the relationship between maternal age and pregnancy risk. As a result, prevention of complications such as preeclampsia, premature birth, or pregnancy hypertension is still less than optimal. Data processing using the Apriori algorithm showed that out of 30 rules formed, there was a best rule with the highest support value of 30% and confidence of 100%. This proves that the relationship between maternal age and pregnancy conditions has a clear pattern and can be used as a basis for developing maternal health strategies, especially for vulnerable age groups.

Keywords: *Apriori Algorithm, Pregnancy, Weka*

1. Introduction

In the era of rapid development of information technology, various innovations have presented new opportunities in the collection, management, and analysis of health data to become relevant information. Pregnancy is one of the important phases in a woman's life that can affect the condition of pregnancy, including the age of the mother. The mother's age during pregnancy is often associated with the risk of certain complications, such as premature birth, preeclampsia, and fetal developmental disorders. Based on health data, women who are too young or too old have a greater chance of experiencing bleeding complications, hypertension in pregnancy, infections in pregnancy compared to women of ideal reproductive age (20–35 years).[1]

Dr. Edward Binjai Clinic is one of the health facilities that provides services to pregnant women, including monitoring pregnancy conditions and handling complications. However, in practice, clinics face challenges in identifying pregnancy risk patterns based on maternal age. So far, medical personnel at the clinic have treated patients based on experience and common protocols without a system that automatically analyzes the patient's historical data to find a relationship between the mother's age and pregnancy risk. As a result, prevention of complications such as preeclampsia, premature birth, or pregnancy hypertension is still less than optimal.

To overcome this problem, a data mining system is needed that can process patient information more systematically and accurately. This system can help in identifying patterns of relationships between maternal age and pregnancy conditions, so that clinics can provide more targeted services, especially in complication prevention measures.

One of the methods that can be used is the A priori algorithm. The A priori method was chosen as a data analysis technique because it is able to efficiently find relationships or association patterns in big data. By applying a priori algorithms, the system can identify hidden patterns in pregnancy data, such as the relationship between the mother's age and certain risks. This will provide data-driven insights to medical personnel in making more informed decisions.

2. Page layout

From the results of the research conducted [2] with a Support value for both symptoms (polyuria and polydipsia) being 0.6, which indicates that 60% of all patients experience both symptoms simultaneously. The confidence that patients with polyuria also experience polydipsia

is 0.75, while the confidence that patients with polydipsia also experience polyuria is 0.857. This suggests that there is a fairly strong association between the two symptoms in the context of a diagnosis of type 2 diabetes.

Results obtained from the research [3] Gradient Boosted is an algorithm that has the highest AUC, precision and recall with 86.6%. . For prediction, the attributes used are age, gender, blood pressure, cholesterol, blood sugar, heart rate, type of chest pain and additional are the results of other physical examinations.

2.1. Definisi Data Mining

Data mining is an effort to extract useful information and patterns from a very large amount of data. The data mining process includes the stages of data collection, data extraction, data analysis, and data statistics. Data mining in other terms is guided as knowledge discovery, knowledge extraction, data or pattern analysis, information harvesting, and others. The important purpose of data mining is: to transform raw data into useful information to support more accurate decision-making and more effective and relevant business strategies.[4]

2.2. Knowledge Discovery In Database (KDD)

Knowledge Discovery In Database (KDD) is an approach used to extract knowledge from existing databases. Tables – Tables that have relationships or relationships with each other in the database. The knowledge generated from the process can serve as a useful knowledge foundation in the context of decision-making Describing the process of identifying information that is not yet known in a vast database is the term Knowledge Discovery in Database (KDD) and data mining that is often used interchangeably. The two terms are related to each other but have different concepts, and the important steps in the KDD process consist of:

1. Data Selection
   Data selection from operational data sets is a necessary step before entering the information mining phase in the Knowledge Discovery in Database (KDD) process. After the data selection process for data mining purposes, the data storage must also be separated from the operational database.
2. Pre-processing / Cleaning
   Data cleansing steps must be carried out before processing data mining. By cleaning up the same data, check the consistency of the data and correct errors in the data such as writing errors. An enrichment process is also implemented, which is a stage to enrich existing data or additional information that is relevant and important in the context of Knowledge Discovery in Database (KDD), including external information or data.
3. Transformation
   Data mining processing is carried out on the selected data, thus the data is suitable for the coding stage. The coding process in Knowledge Discovery in Database (KDD) relies on information patterns to be identified in the database requires creativity.
4. Data Mining
   The steps in data mining involve the use of specific techniques or approaches to reveal significant patterns or insights in the selected data. The reliance on the objectives and processes of Knowledge Discovery in Database (KDD) greatly influences the selection of appropriate methods or algorithms. Various techniques, methods, and algorithms are also used in data mining.
5. Interpretation / Evaluation Interpretation is the processing stage of Knowledge Discovery in Database (KDD) where information is found through the data mining process needs to be conveyed in a way that can be understood by interested parties. In this step, an evaluation is carried out to check the compatibility of the patterns found with previous information.[5]

2.3. Data Mining Process

The data mining process is iterative and can be adjusted according to the needs and desired results. Each stage of this process is important to ensure that data processing produces accurate and reliable insights. By understanding this process, organizations can use their data more efficiently to support innovation and decision-making. [6]

2.4. Techniques and Algorithms in Data Mining

In data mining, there are many different techniques and algorithms that can be adapted to different analytical needs. Choosing the right technique depends on the type of data, the purpose of the analysis, and the desired outcome. With a good understanding of these techniques and algorithms, organizations can more effectively extract information from their data. [6]

2.5. Definition of Data Mining Algorithm

A priori algorithm is a basic algorithm proposed by Agrawal & Skrikant in 1994 to determine Frequent itemsets for Boolean association rules. A priori algorithms belong to the type of association rules on data mining. Rules that state associations between several attributes are often called affinity analysis or market basket analysis. Association rule data mining is a data mining technique to find the rules of a combination of items. One of the stages of association analysis that attracts the attention of many researchers to produce efficient algorithms is frequent pattern mining analysis. The importance of an association can be determined by two benchmarks, namely: support and confidence, support is the percentage of the combination of these items in the database, while confidence is the strength of the relationship between items in the association rules. [7]

The formation of association rules that meet the minimum requirements for confidance by calculating the confidance of the A→B associative rule, where support is supporting data and confidance is confidence.
The confidance value of rule A→B is obtained from the following formula:

$$\text{Support (A)} = \frac{\sum \text{TransaksimengandungAdanB}}{\sum \text{Jumlahseluruhtransaksi}} \text{ x } 100\% \quad \text{.....(1)}$$

$$\text{Confidance (A)} = \frac{\sum \text{TransaksimengandungAdanB}}{\sum \text{TransaksimengandungA}} \text{ x } 100\% \text{.....(2)}$$

Searches for the minimum qualifying combination of items from the support value in the database. The support value of an item is obtained using the following formula:

$$\text{Support (A)} = \frac{\text{Jumlah transaksi mengandung A}}{\text{Total Transaksi}} \text{..... (3)}$$

The support value of the 2 items is obtained using the formula:

$$\text{Support (A,B)} = p\,(A \cap B)$$

$$\text{Support (A,B)} = \frac{\sum \text{Jumlah transaksi mengandung A dan B}}{\sum \text{transaksi}} \text{..... (4)}$$

After all high-frequency patterns are found, then an association rule that meets the minimum requirements for confidence is searched by calculating the confidence of the associative rule A B. The confidence value of rule A B is obtained by the following formula:UU

$$\text{Confidence - P (B|A)} = \frac{\sum \text{J transaksi mengandung A dan B}}{\sum \text{transaksi}} \text{..... (5)}$$

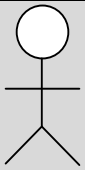
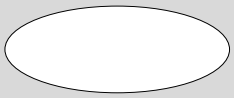
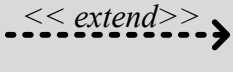
2.6. Definition Pregnancy

Pregnancy is a physiology for women. The changes that accompany the occurrence during pregnancy are something that is common in the prenatal period and this is not a disease but the condition of the body adapts to pregnancy and physical preparation towards labor and puerperium. Midwives in providing care to pregnant women require promotive, preventive and minimizing curative forms of service.[8]

2.7. Use Case Diagram

Use Case Diagram is a modeling for the behavior of the information system to be created. Use cases are used to find out what functions exist in an information system and who has the right to use those functions. Here are the symbols on the use case diagram. [9]

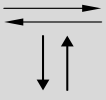
Table 1: Use Case Diagram

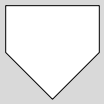
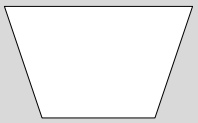
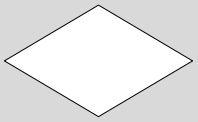
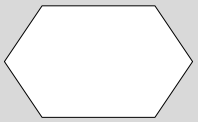
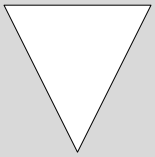
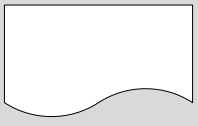
No.	Notasi	Information	Simbol
1	*Actor*	System users or those who interact directly with the system	
2	*Use Case*	An elliptical circle with the name of the use case written in the center of the circle	
3	*Assocat ion*	The line that functions connects the actor with the use case.	
4	*Relasi*	As a link between actor usecase, use caseusecase etc	
5	*Include Relatio nship*	Allows a usecase to use functionality provided by another usecase	
6	*Extend Relatio nship*	Allows usecases to have the possibility to extend the functionality provided by other usecases.	

2.8. Flowchart

Flowchart is a graphical representation of the steps and sequence of procedures of a program. It usually affects the resolution of problems that need to be studied and evaluated further. Flowcharts can be used to present manual activities, processing activities, or both. Flowchart is a series of symbols used to construct. symbols used as follows: [10]

Table 2: Flowchart

No	Name	Information	Simbol
1	Arus/Flow	To express the flow of a process	

No	Name	Information	Simbol
2	Connector	To declare a connection from a process to another in the same page/sheet	
3	Offline Connector	To declare a connection from a process to another in a different page or sheet	
4	Proses	A processing function performed by a computer usually results in changes to data or information.	
5	Symbol manual	To declare a process that is not done by a computer	
6	Decision/Logika	For the menu, tap a specific condition with two YES/NO possibilities	
7	Predefines Proses	To state the provision of storage or processing facilities to provide an initial price.	
8	Terminal	To declare the beginning or end of a program	
9	Offline Storage	To indicate that the data in this symbol will be stored on a certain medium.	
10	Input/Output	To declare the Input and Output process regardless of the type of equipment.	
11	Disk Storage	To declare the input is from the disk or the output is saved to the disk	
12	Document	To print a document	

2.9. WEKA

WEKA is a package of practical machine learning tools. "WEKA" stands for "Waikato Environment for Knowledge Analysis", created at the University of Waikato, New Zealand for research, education and various applications. WEKA is able to solve real-world data mining problems, especially the classification that underlies the machine learning approach. The software is written in a hierarchy of Java classes with an object-oriented method and can run on almost all platforms.

Weka is open source software released under the GNU General Public License. Tools that can be used for dataset preprocessing allow users to focus on the algorithm used without paying too much attention to details such as reading data from files, implementing filtering algorithms, and providing code for evaluation of results. The following is a GUI view of the WEKA application which can be seen in the image below.[11]

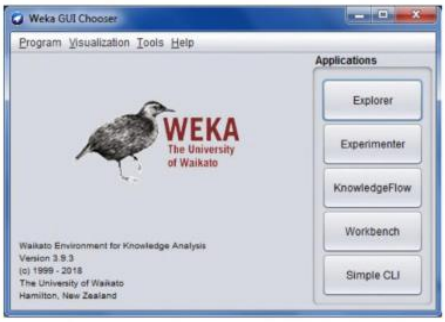


Fig. 1: WEKA

2.10. MySQL

MySQL is a database management system using the well-known SQL (Structured Query Language) basic commands. This multi-user and multi-flow MySQL database management system (DBMS) has been used by more than 6 million users worldwide.[12]

MySQL is an open source DBMS with two licenses: free software (free software) and Shareware (proprietary software with limited use). So, MySQL is a free database server with a GNU General Public License (GPL), so it can be used for personal or commercial purposes without having to pay for an existing license.

2.11. PHP

PHP (Hypertext Processor) is a server-side scripting language that is widely used in the web development process. PHP was originally created by Ramus Lerdorf to monitor the people who visit his home page. Over time, PHP became more and more popular, and Lerdorf eventually released it as an open-source project. Developers began to use, improve, and improve the codes in PHP, until it became the scripting language that is now widely used. PHP is one of the programming languages that must be learned in website development because it is able to make websites dynamic. Some of the reasons why PHP is so popular include: [13]

3. Results and Discussion

The research method carried out is for something systematically using scientific methods and applicable sources. In the process of this research, it is shown to provide more meaningful results for the agency in finding out the relationship between maternal age and pregnancy conditions. The results of the conceptualization will be made into a research method using the literature study pattern as shown in the image below

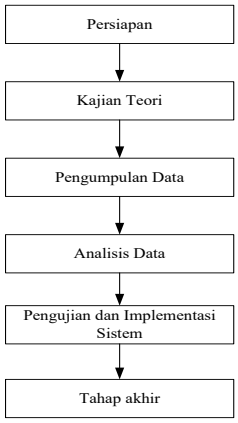


Fig. 2: Research Workflow

3.1. Research Supporting Data

The following is the data obtained from personnel transaction data as shown in the table.

Table 3: Research Supporting Data

No	Mother's Name	Mother's Age	Riwayat Health	Pregnancy Conditions	Pregnancy Outcomes
1	Nina Wahyuni	37	Keguguran	Diabetes Gestasional	Stillbirth (Kematian Janin Intrauterin)
2	Rina Sartika	33	Persalinan prematur	Kehamilan Ektopik	Makrosomia
3	Rosa Lestari	25	Preeklampsia/ hipertensi	Kehamilan Ektopik	Stillbirth (Kematian Janin Intrauterin)

No	Mother's Name	Mother's Age	Riwayat Health	Pregnancy Conditions	Pregnancy Outcomes
4	Siti Lestari	33	Persalinan prematur	Kehamilan Ektopik	Stillbirth (Kematian Janin Intrauterin)
5	Rosa Lestari	31	Persalinan prematur	Kehamilan Ektopik	Stillbirth (Kematian Janin Intrauterin)
6	Maya Lestari	27	Diabetes gestasional	Kehamilan Ektopik	Keguguran (Abortus Spontan)
7	Fitri Sartika	21	Preeklampsia /hipertensi	Kehamilan Ektopik	Keguguran (Abortus Spontan)
8	Citra Handayani	40	Preeklampsia/ hipertensi	Kehamilan Ektopik	Keguguran (Abortus Spontan)
9	Anita Lestari	20	Preeklampsia/ hipertensi	Preeklampsia	Keguguran (Abortus Spontan)
10	Ratna Sari	30	Keguguran	Preeklampsia	Makrosomia
11	Siti Wulandari	42	Preeklampsia/ hipertensi	Kehamilan Ektopik	Stillbirth (Kematian Janin Intrauterin)
12	Siti Sartika	39	Diabetes gestasional	Kehamilan Ektopik	Stillbirth (Kematian Janin Intrauterin)
13	Maya Handayani	28	Persalinan prematur	Kehamilan Ektopik	Makrosomia
14	Yuli Kartika	41	Preeklampsia/ hipertensi	Preeklampsia	Makrosomia
15	Lina Kartika	36	Keguguran	Kehamilan Ektopik	Keguguran (Abortus Spontan)
16	Siti Kartika	35	Diabetes gestasional	Preeklampsia	Keguguran (Abortus Spontan)
17	Anita Wulandari	25	Keguguran	Diabetes Gestasional	Makrosomia
18	Nina Kartika	41	Diabetes gestasional	Diabetes Gestasional	Stillbirth (Kematian Janin Intrauterin)
19	Anita Kartika	40	Preeklampsia/ hipertensi	Preeklampsia	Makrosomia
20	Yeni Wulandari	44	Preeklampsia/ hipertensi	Preeklampsia	Stillbirth (Kematian Janin Intrauterin)

3.2. Application of Methods

From the research conducted to apply the *association rule* method For the relationship between maternal age and pregnancy conditions at the dr. Edwar, Sp. OG Clinic using patient data samples that will be used as research support can be seen at, the data table is a transactional database that will be represented as shown in the table below.

Table 4: Maternal Age Data

Code	Mother's Age
U1	< 18 Tahun
U2	18-25 Tahun
U3	26-35 Tahun
U4	36-45 Tahun
U5	46-55 Tahun
U6	>56 Tahun

Table 5: Medical History

Code	Medical History
R1	Keguguran
R2	Diabetes gestasional
R3	Persalinan prematur
R4	Preeklampsia/hipertensi
R5	Persalinan prematur
R6	Stillbirth
R7	Infertilitas/perawatan IVF

Table 6: Pregnancy Conditions

Code	Pregnancy Conditions
K1	Kehamilan Ektopik
K2	Diabetes Gestasional
K3	Preeklampsia
K4	Anemia Kehamilan
K5	Infeksi dalam Kehamilan (TORCH, ISK, HIV, COVID-19)
K6	Hiperemesis Gravidarum

K7	Gangguan Pertumbuhan Janin (IUGR)
K8	Plasenta Previa dan Solusio Plasenta
K9	Depresi dan Gangguan Psikologis
K10	Kehamilan Kembar

Table 7: Pregnancy Outcomes

Kode	Pregnancy Outcomes
H1	Keguguran (Abortus Spontan)
H2	Stillbirth (Kematian Janin Intrauterin)
H3	Makrosomia
H4	Asfiksia Lahir
H5	SGA (Small for Gestational Age)
H6	Berat Badan Lahir Rendah (BBLR / Low Birth Weight - LBW)
H7	Persalinan Prematur (Preterm Birth)

Table 8: Data Representation

NO	Age of Pregnant Women						Age of Pregnant Women				Pregnancy Conditions			Pregnancy Outcomes		
	U1	U2	U3	U4	U5	U6	R1	R2	R3	R4	K1	K2	K3	H1	H2	H3
1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0
2	0	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0
3	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	0
4	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	0
5	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	0
6	0	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0
7	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0
8	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0
9	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0
10	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1
11	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0
12	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0
13	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1
14	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1
15	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0
16	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0
17	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1
18	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0
19	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1
20	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0
∑	0	3	8	9	0	0	4	4	4	8	11	3	6	7	8	5

Then the process of forming *support* 1 *itemset* will be carried out with *a minimum amount of support* = 10%. With the following formula:

$$\boldsymbol{Support}\ (\mathbf{A}) = \frac{\Sigma \text{ transaksi mengandung A}}{\Sigma \text{ transaksi}} * 100\%$$

Table 9: Support 1 Itemset

ID	Count	Support
U1	0/20	0%
U2	3/20	15%
U3	8/20	40%
U4	9/20	45%
U5	0/20	0%
U6	0/20	0%
R1	4/20	20%
R2	4/20	20%

ID	Count	Support
R3	4/20	20%
R4	8/20	40%
K1	11/20	55%
K2	3/20	15%
K3	6/20	30%
H1	7/20	35%
H2	8/20	40%
H3	5/20	25%

After obtaining 1 itemset selected some data that meets the predetermined value, the value itself is the limit of the number used to obtain the selected number, the support value is 15%, as seen in the following table:

Table 10: Support 1 Itemset

ID	*Count*	*Support*
U2	3/20	15%
U3	8/20	40%
U4	9/20	45%
R1	4/20	20%
R2	4/20	20%
R3	4/20	20%
R4	8/20	40%
K1	11/20	55%
K2	3/20	15%
K3	6/20	30%
H1	7/20	35%
H2	8/20	40%
H3	5/20	25%

$$\textbf{Support}\ (\mathbf{A},\mathbf{B}) = \frac{\Sigma\ \text{transaksi mengandung A dan B}}{\Sigma\ \text{transaksi}} * 100\%$$

The combination of 2 itemsets that do not meet the minimum support requirements will be eliminated and some data that meets the predetermined value will be selected, the value itself is the limit of the number used to obtain the selected number, the support value is 15%, as seen in the table below.

Table 11: Support 2 Itemset

ID	Count	Support
U2, R4	3/20	15%
U3, R3	4/20	20%
U3, K1	5/20	25%
U3, H1	3/20	15%
U3, H3	3/20	15%
U4, R4	5/20	25%
U4, K1	4/20	20%
U4, K3	4/20	20%
U4, H2	5/20	25%
R3, K1	4/20	20%
R4, K1	4/20	20%
R4, K3	4/20	20%
R4, H1	3/20	15%
R4, H2	3/20	15%

ID	Count	Support
K1, H1	5/20	25%
K1, H2	5/20	25%
K3, H3	3/20	15%

From the Table above, the element above T means interrelated items, while F means no related items. The number of frequency of the item set must be greater than the number of frequency of the Itemset θ.

The process of forming C3 or called the minimum amount of *support* = 15%, the calculation results can be seen in table with the following formula:

$$\textbf{Support}\ (\mathbf{A},\mathbf{B}) = \frac{\Sigma\ \text{transaksi mengandung A, B \& C}}{\Sigma\ \text{transaksi}} * 100\%$$

Table 11: Support 3 Itemset

ID	Count	Support
U3, R3, K1	4/20	20%
U3, K1, H1	3/20	15%
U4, R4, K3	3/20	15%

From the Table above, the element above T means interrelated items, while F means no related items. The number of frequencies of the set item must be greater than the number of frequencies of the Itemsset θ. From the table above, f3 is obtained: {U3, R3, K1, H1}.

Table 12: Support 4 Itemset

NO	U3	R3	K1	H1	*f*
1	0	0	0	0	*F*
2	1	1	1	1	*T*
3	0	0	1	0	*F*
4	1	1	1	0	*F*
5	1	1	1	0	*F*
6	1	0	1	1	*F*
7	0	0	1	1	*F*
8	0	0	1	1	*F*
9	0	0	0	1	*F*
10	1	0	0	0	*F*
11	0	0	1	0	*F*
12	0	0	1	0	*F*
13	1	1	1	0	*F*
14	0	0	0	0	*F*
15	0	0	1	1	*F*
16	1	0	0	1	*F*
17	1	0	0	0	*F*
18	0	0	0	0	*F*
19	0	0	0	0	*F*
20	0	0	0	0	*F*
Jumlah					1

The process of forming C4 or called the minimum amount of *support* = 5%, the results of the calculation can be seen in table with the following formula:

$$\boldsymbol{Support}\ (\boldsymbol{A},\boldsymbol{B}) = \frac{\Sigma\ \text{transaksi mengandung A, B, C \& D}}{\Sigma\ \text{transaksi}} * 100\%$$

Table 12: Support 4 Itemset

ID	*Count*	*Support*
U3, R3, K1, H1	1/20	5%

After obtaining 4 itemsets, some data that meets the specified value, the value itself is the limit of the number used to obtain the selected number, the support value is 5%, as seen in the following table:

Table 13: Support 4 Itemset

ID	*Count*	*Support*
U3, R3, K1, H1	1/20	5%

After all the high-frequency patterns are found, then the association rules with the results of the frequency patterns shown in Table III are sought. 16 as follows:

Table 14: Support 4 Itemset

ID	*Count*	*Support*
U3, R3, K1, H1	1/20	5%

After all the high-frequency patterns are found, then the association rules that meet the minimum requirements for confidence are searched by calculating confidence or A→B associations, with a minimum confidence of 5%.

Table 15: Asosiation Rule

Rule	**Confidance**	
Jika usia ibu 26-35 Tahun (U3) dan memiliki Riwayat kesehatan persalinan prematur (R3) dengan kondisi kehamilan Kehamilan Ektopik (K1) maka Hasil kehamilan keguguran (Abortus Spontan) (H1)	1/1	100%

Lift Ratio is a measure (parameter) to determine the strength of the association *rule* that has been formed from *the value of support* and *confidence*. The lift *ratio value* is usually used as a determinant of whether an association rule is valid or invalid.

$$Excepted\ Confidence = \frac{\sum TransaksiMengandungKonsekuen}{\sum Transaksi} \text{ x } 100\%$$

Table 16: Support 4 Itemset

ID	*Count*	*Support*
U3, R3, K1, H1	1/20	5%

$$Lift\ Ratio = \frac{Confidence}{\sum Expected\ Confidence} \text{ x } 100\%$$

Example of Lift Ratio Value Calculation : A => B Confidence A & B = 90.90% and Expected Confidence = 30%.

Table 17: Support 4 Itemset

Rule	**Support**	**Confidance**	**Expected Confidance**	**Lift ratio**
Jika usia ibu 26-35 Tahun dan memiliki riwayat kesehatan hipertensi dengan kondisi kehamilan normal maka Hasil kehamilan melahirkan normal	5%	100%	5%	20,00

After conducting the above case experiment with a minimum of support = 10%, confidence = 100% so that the results of the rule that meet the support and confidence values are obtained, namely: If the mother is 26-35 years old and has a medical history of hypertension with normal pregnancy conditions, then the pregnancy results are normal, then the score is successful with a support value of 5% with a confidence value of 100% and Rated Lift ratio 20.00

3.3. Design Flowchart

The flowchart design can be described as follows:

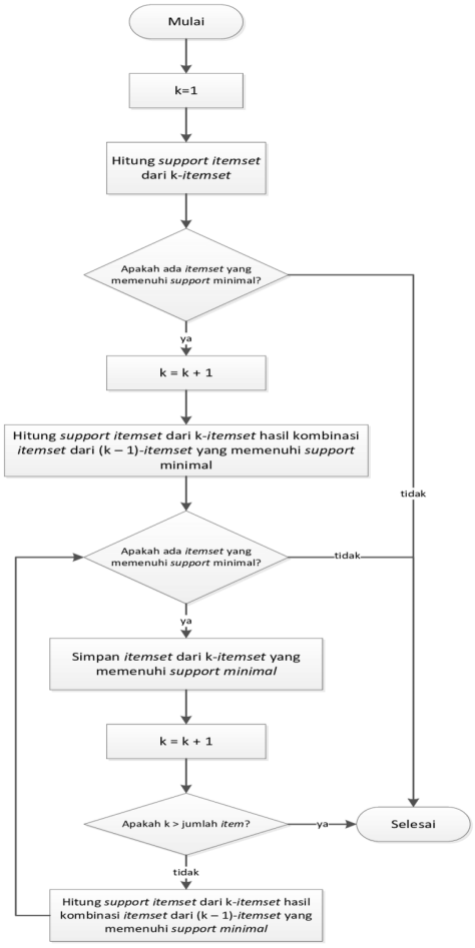


Fig. 3: Flowchart

3.4. Use Case Diagram

Furthermore, to understand how the system will be built, you can see the system process in general through the Unified Modeling Language (UML), such as the following usecase diagram:

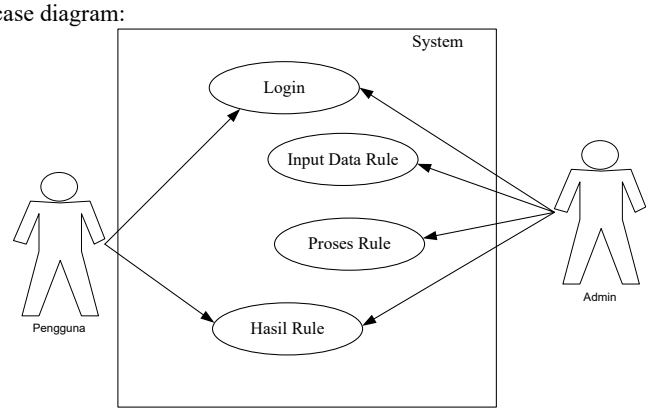


Fig. 4: Use Case Diagram

3.5. Data Dictionary Design

The following is a design of a data dictionary in determining the relationship between maternal age and pregnancy conditions:

1. tbl_user = {@username+ password } This table serves as the login admin that manages the data.
2. tb_data = {@id + nama_ibu + usia_ibu+kondisi_kehamilan + kehamilan_ke+ hasil_kehamilan+ riwayat_kesehatan }
3. tb_apriori + {@no+nama_item+mmin_support+min_cofindence}

3.6. Design Table

After doing the normalization stage, the next stage is to design the Table structure on the system database to be created, the following is the design of the Table structure: Admin Table Structure The admin table is used to store Username, Password data, more about the structure of this Table can be seen in table below

Table 18: Design Table Admin

Field Name	Data Type	Size	Information
username	Int	18	**Username*
Password	Varchar	8	*Password*

Transaction Table Structure Data tables are used to store patient data, more information about the structure of this table can be seen in the Table below:

Table 19: Design Table Data

Field Name	Type Data	Size	Information
Id	nvarchar	8	Id
nama_ibu	nvarchar	25	nama ibu
usia_ibu	nvarchar	25	usia ibu
kondisi_kehamilan	nvarchar	25	kondisi kehamilan
kehamilan_ke	nvarchar	25	kehamilan ke
hasil_kehamilan	nvarchar	25	hasil kehamilan
riwayat_kesehatan	nvarchar	25	riwayat kesehatan

Structure of the Confidence Table The confidence table is used to store data records for minimum support and minimum confidence, more details about the structure of this table can be seen in the table below:

Table 20: Design Table Apriori

Field Name	Type Data	Size	Infotmation
No	Int	4	Nomor
nama_item	nvarchar	25	Nama *Item*
min_support	Nchar	18	*Support*
min_confidence	Nchar	18	*Confidence*

3.7. Home Form

The description of the results will be designed using a system on a computer or program that can be seen by the user and the mechanism used in controlling the operation of entering a data. The interface design can be seen in the following image:

Fig. 5: Home Form

3.8. Form Login

On this page is a page where in the login menu the admin must have admin access rights so that he must do the login process first.

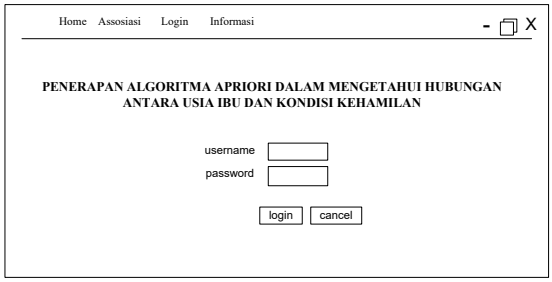


Fig. 6: Form Login

3.9. Form Asosiasi

On the page below is the Rule Association page.

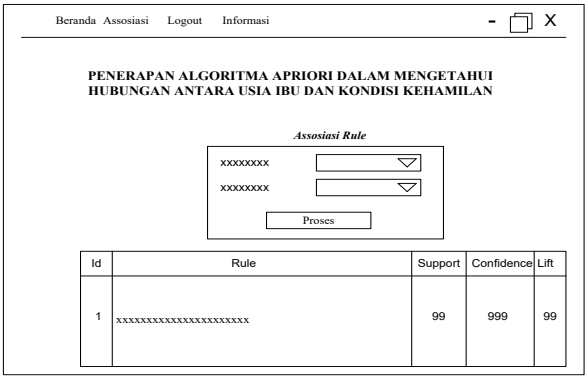


Fig. 7: Form Asosiation Rule

3.10. Form Information

On the page below is the information page

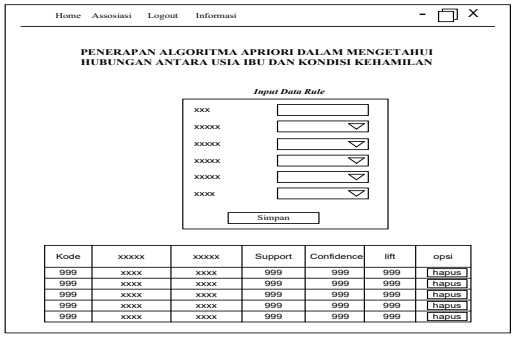


Fig. 8: Form Information

3.11. A priori Algorithm Output Results

The image displayed is the output of the A priori algorithm in the Weka Explorer software, specifically on the "Associate" tab used to find association rules in a dataset. A priori algorithms are used to analyze patterns of relationships between attributes in data. At the top, it can be seen that the user has chosen an A priori algorithm and set several parameters, such as a minimum support of 0.1 (10%), a minimum confidence of 0.1 (10%), and a maximum limit of 1000 rules produced. The data used consisted of 500 instances (data rows) and 16 attributes related to medical conditions during pregnancy, such as age, miscarriage, gestational diabetes, preeclampsia, ectopic pregnancy, and pregnancy outcomes. In the output section, information is displayed that the process runs as many as 18 cycles to produce association rules that meet the minimum support and confidence requirements.

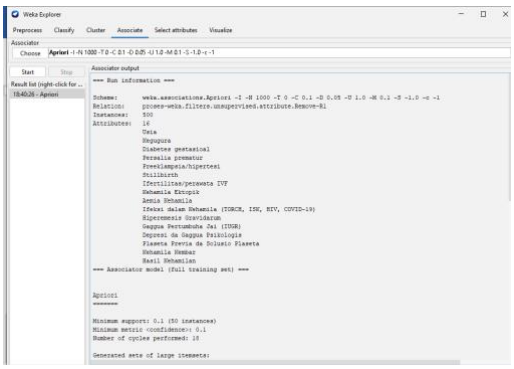


Fig. 9: Results of A Priori Algorithm Output

4. Conclusions and Suggestions

4.1. Conclusion

Based on the research that has been carried out and the results of the discussion in the previous chapter, several main conclusions can be drawn that explain how the application of a priori algorithm can be used to determine the relationship between maternal age and pregnancy conditions.

1. Using a priori algorithm, the correlation between maternal age and pregnancy conditions can be implemented through a data analysis process by determining the support, confidence, and lift values. From this process, a number of rules are formed that are able to describe significant patterns of interconnectedness, for example, certain age groups are more susceptible to experiencing specific pregnancy conditions.
2. The data processing application built is able to help agencies or health workers in finding out the relationship between maternal age and pregnancy conditions more quickly, efficiently, and accurately. This system can present an automatic linkage pattern so that it can support the decision-making process, both for the prevention and handling of cases of risky pregnancy.
3. The results of data processing using the A priori algorithm show that of the 30 rules formed, there is a best rule with the highest support value of 30% and 100% confidence. This proves that the relationship between maternal age and pregnancy conditions has a clear pattern and can be used as a basis for developing health strategies for pregnant women, especially in vulnerable age groups.

4.2. Suggestion

Given the limitations in this research, both in terms of knowledge, data, and methods used, the author provides several suggestions that are expected to be inputs and references for future research, namely the following:

1. Further research can use a larger and varied amount of data so that the correlation patterns found with the Apriori algorithm are more accurate and can describe real conditions more comprehensively.
2. The application system that is built should continue to be developed, for example by adding a graphical visualization feature or an interactive dashboard, so that information on the relationship between maternal age and pregnancy conditions is easier to understand by health workers and related agencies.
3. The results of this study are expected to be used by health institutions as a consideration in providing counseling programs, routine checkups, and pregnancy risk prevention, especially in the age group of mothers who are classified as vulnerable, so that they can help reduce the number of pregnancy complications.

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