Anti-Hypertension Drugs Classes of Prevention and Side Effects Diseases Efficiency Analysis in Association Rule Mining Techniques

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ABSTRACT

Purpose: *The Healthcare department, pharmaceutical department, Hospital and Clinical sector find out and explore the diseases of status, where it has been spreaded the communicable and non-communicable diseases among the society. The healthcare department conducting different awareness of programming about the different diseases how is affected people and how is prevented the diseases in society. Accordingly, all the healthcare awareness of information passed through the different media channel, even though high and low blood pressure is pressing public health challenges and it is recognized as the biggest contributor to the global burden of diseases. Presently people health is silently affected by blood pressure low and high level and they unable to recognize that something is amiss, high blood pressure is known as the "silent killer" and If blood pressure is excessively elevated, it may have an impact on organ damage or health issues like coronary arteries, heart valve dysfunction, diabetes, kidney diseases, heart attack and stroke this all are risk factors of blood pressure abnormal status. Hypertension diseases affected the patients need to the best prevention and feature safety. The Doctors, Pharmacist and Nurse are using Anti - hypertension drugs classes of medicines for patients. Which anti-hypertension drug classes of medicine good efficacy for patients and anti-hypertension drugs classes of medicine prevention diseases, side effects diseases knowledge is important for healthcare professional. Machine learning and Data mining knowledge discovery techniques need to understand how different classes of anti-hypertensive drugs might interact with the patient's and medications. If the healthcare professional has access to a predictive data mining technique model, they could use this to anticipate how the patient's condition might change over time and adjust the treatment plan proactively. This kind of analytical data mining knowledge can lead to more effective treatment and better patient outcomes.*

Design/Methodology/Approach: *Developing machine learning concept for different anti-hypertension drugs classes of medicine efficiency analysis in hypertension prevention diseases and side effects diseases and Healthcare professional to take right decision for future adjusts treatment plan to the hypertension affected patients.*

Findings/Result: *Orange data mining analytical tool to identify the anti-hypertension drugs classes of medicines efficacy and Doctors can take right decision to better treatment for the patients.*

Originality/Value: *Data mining association rules of support, confidence and lift correlation analysis system helps to identified about the drug of new knowledge efficiency.*

Paper Type: *Analytical research methods applied for analysis the different types of anti-hypertension drugs classes of association correlation efficacy in data mining machine learning system.*

Keywords: Data mining KDD, Association rule, Hypertension of diseases, Anti-Hypertension drug classes, Hypertension prevention and side effects diseases, Orange Software and Microsoft Software.

1. INTRODUCTION:

KDD process has emerged as a key computer tool in the field of medical informatics and Health Information Management (HIM**)** practice of acquiring, analysing and store in healthcare organization departments of information extraction and automatic identification of unknown classes, large-scale picture analysis for assistive technology, epidemiology, patient care and monitoring systems, and people health informatics. Data mining knowledge discovery prediction system helps to business management, production control, research projects, market analysis, engineering design and science exploration. Hypertension is becoming a global spread and threat to the world population because people are whether educated or uneducated all having lacking of knowledge about the arterial pressure or hypertension this high blood pressure affects our arteries and heart function. when the force of blood against the walls of arteries is consistently too high, this is the significant of cardiovascular disease, dementia, peripheral artery disease, heart failure, stroke, atrial fibrillation, vision loss, and chronic renal disease. et al(Han, J., Kamber, M., & Pei, J. 2012)[1] and (Amarchand, R., Kulothungan, V., Krishnan, A., & Mathur, P. 2023)[82].The force of blood pressing against artery walls is known as blood pressure, and it is created when the heart pumps blood into the arteries on a regular basis. Systolic pressure at its peak when the heart is pumping blood, is the term used to describe this condition. A drop in blood pressure during a heartbeat, or diastolic pressure, occurs when the circulatory system is at rest. Basically, people are unable to recognize that something is amiss, high blood pressure is known as the "silent killer" because it may be subtly endangering our health. If blood pressure is excessively elevated, it may have an impact on organ damage or health issues like coronary arteries, heart valve dysfunction, diabetes, kidney diseases, heart attack and stroke this all are risk factors of blood pressure abnormal status. The best prevention for hypertension daily we should care about blood pressure measurement of numbers level is necessary and anti-hypertensive medication taking with experienced doctor for our good health. Hypertension or blood pressure level and anti-hypertension medicines of efficacy knowledge is necessary for pharmaceutical sector. In medical terms, efficacy refers to the ability of a product or treatment to provide a beneficial effect and In pharmacology, efficacy describes the maximum response achieved with a drug effectiveness. A medication's efficacy is taken into two distinct ways, “method effectiveness” and “use” effectiveness. Data mining associations rule of techniques such that support, confidence and correlation lift computation system help to prediction of drugs class efficacy. This research paper exploration about the anti-hypertension medication prevention diseases and side effects of diseases efficacy analysis in probability of statistical methods, Apropri algorithm, Microsoft software and graphical representation. Data mining system prediction the process of efficient discovery of non obvious valuable patterns from a large collection of data. An abundance of antihypertensive as well as high blood pressure drugs on the market right now from different pharmaceutical sector or companies. Drug efficiency finding the support, confidence, and correlation lift of strength is based on data mining association rules of prediction methods or strong association relationships between drug classes and their efficacy, which are utilized to find new information and understanding regarding the effectiveness of drugs in terms of illness prevention and side effect diseases management.et al(Kundapur, R., Modi, B., Rashmi,A.,Mendagudli, R.R.,Sunhitha, V & Saxena, D.2023)[83] and (Rastogi, P. 2024)[84].

2. LITERATURE REVIEW:

2.1 Data Mining:

The finding previously unidentified patterns from the massive amount of data held in flat files, databases, data warehouses kind of records store is known as data mining, or knowledge discovery in databases (KDD). Computer science researchers that specialize in finding patterns, correlations, anomalies, and statistically significant structures in data are known as knowledge discovery in databases. et al (Han, J., Kamber, M., & Pei, J. 2012) [1] and (Hand, D. J. 2007)[2]. KDD is a crucial stage in the knowledge discovery process in databases, and the information industry is particularly interested in it. The KDD method involves an iterative sequence of data cleaning, data integration, data selection, data mining pattern detection, and knowledge presentation. The obtained knowledge might

be applied to prediction and decision making. et al (Fayyad, U., Piatetsky-Shapiro, G., & Smyth, P. 1996) [3] and (Giannopoulou, E. (Ed.). 2008) [61]. The KDD approaches are frequently applied in scientific and engineering fields like bioinformatics, genetics, medicine, education and electrical power engineering.The generate the building a model from data is the key distinctive aspect of data mining. Various data mining approaches can carry out one or more of the following data modelling tasks, including association classification, clustering, forecasting, regression, sequence finding, and visualization. et.al (Ngai, E. W., Xiu, L., & Chau, D. C. 2009) [4]. The statistical analysis along with database technology using with data mining associations can uncover hidden patterns and relationships in big databases. Statistical analysis can be performed to confirm the accuracy of results achieved from various techniques. Several hypotheses can be proposed, about the need of particular medicine, its proposed side effects, the healing impact of the medicine. Data mining tool uses in statistical methods and machine learning algorithms to discover patterns and relationships in data and significance information predicted patterns and reports. et al (Berson, A., & Smith, S. J.1997) [5] and (Berka, P., Rauch, J., & Zighed, D. A. (Eds.)..2009) [62].

2.2 Data Mining Techniques:

The following forms of data modelling can be carried out using data mining techniques: **Association:** The goal of association is to create a connection between objects that are present in a record together. as well as the association model usually adopted common tools for statistics and apriori algorithm. et al (Ahmed.S.R.2004) [6]. **Classification:** This technique tries to create a model that can predict how customers will act in the future by separating database entries into a number of predetermined classes according to specific criteria. Neural networks, decision trees, and if then else rules are prominent tools used in classification. et al (Ahmed.S.R.2004) [6]. **Clustering:** an assortment of people in a number of increasingly homogeneous clusters is the process of clustering. This is common tools for clustering include neural networks and discrimination analysis. et al (Ahmed.S.R.2004) [6] and (Berry, M. J., & Linoff, G. S. 2009) [7]. **Regression:** This type of statistical estimating approaches is implemented to give prediction values from databases by mapping each data object to an actual value. One the most frequently used tools for regression is linear regression and logistic regression.et al(Giraud-Carrier, C., & Povel,O.2003)[8].**Sequence discovery:** The identification of a relationship or pattern across time is known as sequence discovery. A Set theory and statistics are common methods for sequence discovery. et al(Berson, A., & Thearling, K .1999)[9]. **Visualization:** The presentation of data to enable viewers to see intricate patterns is referred to as visualization. It offers a thorough comprehension of the pattern or relationship data that has been found.et al (Turban, E.2011) [10] and (Karahoca, A. (Ed.).2012) [63]. Data mining techniques help to the pharmaceutical industry is well known for performing measured or expressed in terms of quantity analysis for clinical research and market research. In the marketing departments are used for sales force planning and direct marketing to doctors and consumers.et. al (Ranjan, J. 2007)[11] and(Fernández-Llatas, C., & García-Gómez, J. M. (Eds.).2015)[64]. Data mining knowledge discovery used to prediction of human genetics, the important goal is to understand the mapping relationship between the inter individual variation in human DNA sequences and variability in diseases susceptibility. Data mining knowledge discovery system is mainly used for predicting the diseases from the datasets in health care industry. The KDD mining concepts uses two strategies supervised and unsupervised learning. In supervised learning define a training set is used to learn model parameters whereas in unsupervised learning no training set is used. et al(Obenshain, M. K. 2004)[12].

2.3 Algorithms for mining:

Data mining approaches apply the algorithms that underpin them as well as the algorithms for processing data. These algorithms are employed based on the Business, Science, Engineering, Medical, and pharmaceutical sectors and operate on data extraction software. Some of the algorithms that are commonly utilized by businesses to evaluate data sets are defined in various sorts of algorithms like that **K-means:** A typical cluster analysis technique is the grouping of comparable objects together in a cluster. **Apriori Algorithm:** Using association rules, it is a typical item set mining technique used on transactional databases. An association rule is implemented to this frequent item set mining technique on transactional databases. It will be identifying recurring item groups and point out general trends.et al (**Zhao**, F. 2024) [85]. **Nearest Neighbour:** Regression analysis and classification are two applications of this technique. When new unlabeled data is received, the k closest neighbor algorithm

performs lazy learning by storing the training data and classifying the incoming data. **Naves Bayes:** This collection of straightforward probabilistic classification algorithms is predicated on the idea that the attributes of each data object are independent of one another. It's a Bayes theorem application. **AdaBoost:** Adaboost is a performance-enhancing machine learning meta-algorithm that is sensitive to noisy input and outliers.et al (Savasere, A., Omiecinski, E., & Navathe, S. 1995) [13] and (Soni, J., Ansari, U., Sharma, D., & Soni, S. 2011) [65].

2.4 Association Rules:

Many-level, or multilevel, association rules are the ones that are produced by mining data at several levels of abstraction. The under a support-confidence paradigm, data mining multilevel association rules can be mined effectively with idea hierarchies. The KDD systems should have the ability to explore shared multi-level mining at every stage and extract association rules across all abstraction levels. Any technique for finding frequently occurring item sets can be applied, including Apriori and its variants that use uniform minimum support for all levels, also known as uniform support. using reduced minimum support at lower levels referred as reduced support, and using item or group-based minimum support referred to as group-based support. et al. (Han, J., & Fu, Y. 1995) [14], (Liu, B., Hsu, W., & Ma, Y. 1999) [15] and (Kajal, A., & Kajal, I. 2012) [16]. Data mining techniques appear to be highly suitable for bioinformatics due to its tremendous richness. Numerous datasets in biology and allied life sciences fields like neurology and medicine can be mined to obtain valuable information. Reconstructing protein and gene interaction networks, data purification, disease diagnosis, prognosis, and treatment optimization are a few bioinformatics applications of data mining. pharmaceuticals: using bioinformatics to analyze life science data sequence order to aid in future drug discovery and development processes and this achieved by clustering the molecules into groups according to the chemical properties of the molecules via cluster analysis. et al (Ekwonwune, E. N., Ubochi, C. I., & Duroha, A. E.2022) [17] and (Ahmed, A., & Hannan, S. A. 2012) [66].

2.5 Machine Learning Software:

The field of artificial intelligence known as "machine learning" is focused on developing methods that enable computers to learn. Specifically, machine learning refers to a process that builds computer programs through data analysis. Search engines, medical diagnosis, credit card fraud detection, stock market analysis, DNA sequence analysis, classification, speech and handwriting recognition, identification of entities in computer vision, gaming, and Data mining software is called data extracting tools. The tools' back ends are algorithmic. These tools come in licensed, free, and open-source versions on the market. Among the Data Extraction Tools are the following: **RapidMiner**: RapidMiner is an open-source software platform that combines predictive model deployment, machine learning, and data preparation for analytics teams. This program is used to create data models and do data mining analysis. It contains sizable collections of algorithms for regression, association rule mining, clustering, and classification. et al (Hofmann, M., & Klinkenberg, R. Eds. 2016) [18] and (Sadarina, P., Kothari, M., & Gondaliya, J.2013) [67]. **Orange**: This open-source utility is a software for data processing and visualization. Any Python environment that is operational can import Orange. It works effectively for novice researchers.et al (Demšar, J., Curk, T., Erjavec, A., Gorup, Č., Hočevar, T., Milutinovič, M. & Zupan, B. 2013) [19]. **KEEL:** A free Java software package called KEEL (Knowledge Extraction based on Evolutionary Learning) can be used for a wide range of knowledge data finding applications.et al (Triguero, I., González, S., Moyano, J. M., García, S., Alcalá-Fdez, J., Luengo, J. & Herrera, F. 2017) [20]. **SPSS:** Global Business Process Automation IBM offers a data mining and text analytics program called SPSS Modeler. Predictive model construction and other analytical work are done with it. et al (Hickey, G. L., Grant, S. W., Dunning, J., & Siepe, M. 2018) [21]. **KNIME:** Konstanz Information Miner open-source program with specialized algorithms for sentiment analysis and social network analysis, as well as a data cleaning and analysis package. KNIME is capable of combining data from different sources into a single analysis. It is compatible with R, Python, and Java programming languages. et al (Berthold, M. R., Cebron, N., Dill, F., Gabriel, T. R., Kötter, T., Meinl, T. & Wiswedel, B. 2009) [22] and (Jovic, A., Brkic, K., & Bogunovic, N. 2014) [23].

2.6 Hypertension:

Hypertension, or abnormal arterial pressure, is dangerous because it increases the risk of heart attacks, strokes, heart failure, kidney disease, and many other illnesses. Hypertension is traditionally persistent systolic blood pressure (BP) of at least 140 mm Hg and/or diastolic BP of at least 90 mm Hg, or BP that is controlled to guideline-recommended levels using antihypertensive medication.et al (Pickering, T. G., Miller, N. H., Ogedegbe, G., Krakoff, L. R., Artinian, N. T., & Goff, D. 2008)[24] and (Joshi, S., & Joshi, H.2013)[68].The development of ischemic heart disease, heart failure, stroke, and chronic kidney disease is reliably linked to hypertension.an estimated Hypertension is a contributing factor in 57% and 24% of deaths from stroke and coronary artery disease, respectively. et al (Ramakrishnan, S., Zachariah, G., Gupta, K., Rao, J. S., Mohanan, P. P., Venugopal, K., & Banerjee, S. C. A. 2019) [25]. The cardiovascular diseases include a wide range of condition that affects the heart and the blood vessels and the manner in which blood is pumped and circulated through the body. Cardiovascular diseases result in severe illness, disability and death. et al (Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo Jr, J.L. 2003) [26] and (Durairaj, M., & Ranjani, V.2013)[69]. Numerous risk factors, including population aging, family history, socioeconomic shifts favoring sedentary lifestyles, obesity, smoking, alcohol consumption, bad eating habits, and stress, are closely linked to the formation of hypertension and other cardiovascular illnesses.et al (Pooja, P., & Mittal, Y. 2013) [27] and (Nalawade, S. L., & Kulkarni, R. V. .2013) [70]. Hypertension and diabetes are the silent killer diseases worldwide and major risk factor for many other diseases like cardiovascular diseases, stroke, renal diseases, et al (Cheng, S., Lichtman, J. H., Amatruda, J. M., Smith, G. L. Mattera, J. A., Roumanis, S. A., & Krumholz, H. M. 2005) [28].

2.7 Anti-hypertensive Drugs:

Several types of medicine are applied to treat high blood pressure. Most of the time, only a single drug will be used at first. If blood pressure is at stage 2, might start taking two medications. To treat high blood pressure, one or more of these medications is frequently utilized. The following list of blood pressure medications is available in several brand and generic names: **Diuretics is** sometimes called water pills, help rid body of salt (sodium) and water and most of them help your kidneys release more sodium into your urine. The sodium takes with it water from blood, decreasing the amount of fluid flowing through veins and arteries. This reduces blood pressure. These are three types Thiazide, Loop and Potassium sparing.et al (Ellison, D. H. 2019) [29] and (Sica, D. A. 2004) [30]. **Beta-blockers** make the heart beat at a slower rate and with less force. **Angiotensin-converting enzyme inhibitors** (also called **ACE inhibitors**) relax your blood vessels, which lowers your blood pressure. **Angiotensin II receptor** blockers (also called **ARBs**) work in about the same way as angiotensin-converting enzyme inhibitors. **Calcium channel blockers** relax blood vessels by reducing calcium entering cells. Blood pressure medicines that are not used as often include: **Alpha-blockers** help relax your blood vessels, which lowers your blood pressure. **Centrally acting drugs** signal your brain and nervous system to relax your blood vessels. **Vasodilators** signal the muscles in the walls of blood vessels to relax. and Renin **inhibitors**, a newer type of medicine for treating high blood pressure, act by reducing amount of angiotensin precursors thereby relaxing your blood vessels. et al (Arnett, D. K., & Claas, S. A. 2009) [31].

3. DATA MINING KDD PROCESS :

The study of the "knowledge discovery in databases" process, or KDD, is called data mining. Finding patterns in huge data sets using techniques at the interface of statistics, machine learning, and systems is the process of data mining. Data mining is the analysis the "knowledge discovery in databases" process, or KDD. et al(Prabhakaran, D., Singh, K., Roth, G. A., Banerjee, A., Pagidipati, N. J., & Huffman, M. D.2018)[75] and Ogundele, I. O., Popoola, O. L., Oyesola, O. O., & Orija, K. T. 2018)[76]. Data mining process is discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and systems. Data mining methods can respond to analytical queries such as: what is discovery of new molecules and issues over it? What factors or combinations are directly impacting the drugs? What are the best and outstanding drugs? Which drugs are likely to be retained? How to optimally allocate resources to ensure effectiveness and efficiency? Pharmacy management can function more efficiently with the application of data mining. Drug delivery and discovery processes can be made better with the use of data mining tools. It can find patterns in vast

amounts of data, which may provide fresh perspectives and possibly more potent medications.et al (Parvathi, I., & Rautaray, S. (2014) [71] and (Aljumah, A. A., & Siddiqui, M. K. 2014) [72].

3.1 Steps in data mining process:

The computational technique of finding patterns in massive datasets or information from enormous amounts of data is known as data mining.et al. (Wang,P.,& Li,J. 2021)[80],(Fayyad, U., Piatetsky-Shapiro, G., & Smyth, P. 1996) [3], (Wildan, A., Burhansyah, H. A., & Ferdiansyah, C. 2024) [73]and (Reddy, R. P., Mandakini, C., & Radhika, C. 2020) [68].

1. Raw data:

The term raw data is used most commonly to refer to information that is gathered for a research study before that information has been transformed or analyzed in any way. Raw data is unprocessed computer data. This information may be warehoused in a file or information entered into a database is often called raw data.

2. Target data:

Target data mining is the process of using a technology and gathering data. The target data can take on any form based on the needs and knowledge found in the database to improve comprehension of the knowledge's raw data.

3. Data pre-processed data:

Data pre-processing defined about the data mining technique that involves transforming raw data into an understandable format.

4. Transformed data:

In computing, Data transformation is the process of converting data from one format or structure into another format or structure. It is a fundamental aspect of most data integration and data management tasks.

5. Patterns and Rules:

A pattern means data are correlated consists of discovering interesting, useful, and unexpected patterns in databases various types of patterns can be discovered from databases. A rule is mining searches for interesting relationships between objects in a certain data collection.

7. Knowledge:

Knowledge is integrated information, including facts and their relations, which have been perceived, discovered or learned as our 'Mental pictures'

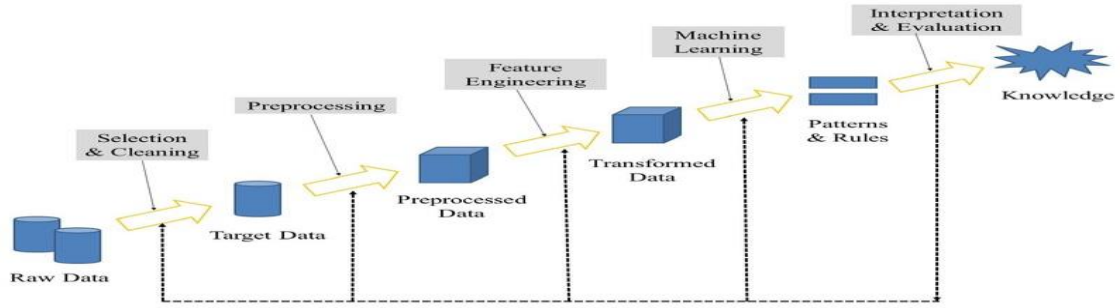


Fig. 1: Data mining process for knowledge discovery in database

Data selection: Finding pertinent data in the database is the process of data selection. **Data cleaning:** It is the process of removing noise and inconsistent data. **Pre-processing:** Data pre-processing and data mining technique which is used to transform the raw data in a useful and efficient format. **Feature Engineering:** Feature engineering is the process of using domain knowledge to extract features from raw **d**ata via data mining techniques. **Machine learning:** Machine learning is implementing some form of artificial "learning", where "learning" is the ability to alter an existing model based on new information. Machine learning is utilized along with order to improve the decision-making models. **Interpretation and evaluation:** Interpretation and evolution is the final phase in which one discovered knowledge is visually represented to the user. This essential step uses visualization techniques to help users understand and interpret the data mining results.et al (Howlader, S., Biswas, T., Roy, A., Mortuja, G., & Nandi, D. 2023) [74].

4. OBJECTIVES:

To analysis the hypertension diseases of impacts and anti-hypertension drugs efficiency using with data mining machine learning software.
To identify the anti-hypertension drug efficacy in different types of anti-hypertensions drugs classes.
To identify patterns and relationships among the anti-hypertension drugs classes of prevention and side effects.
To evaluate effectiveness of anti-hypertension drugs classes using with data mining association rules.
To make the future better decision making about the anti-hypertension drug classes efficacy for healthcare sector.

5. RESEARCH METHODOLOGY:

The association rule techniques in medical studies are growing gradually. The objective of this research paper to provide an overview of current studies on the use of data mining techniques in medical diagnostics and drugs prevention, side effects of problem analysis such that hypertension diseases, how affected human arteries a blood vessel that carries blood from the heart to the body? Anti-hypertensive drugs can be resolved from hypertension of diseases.

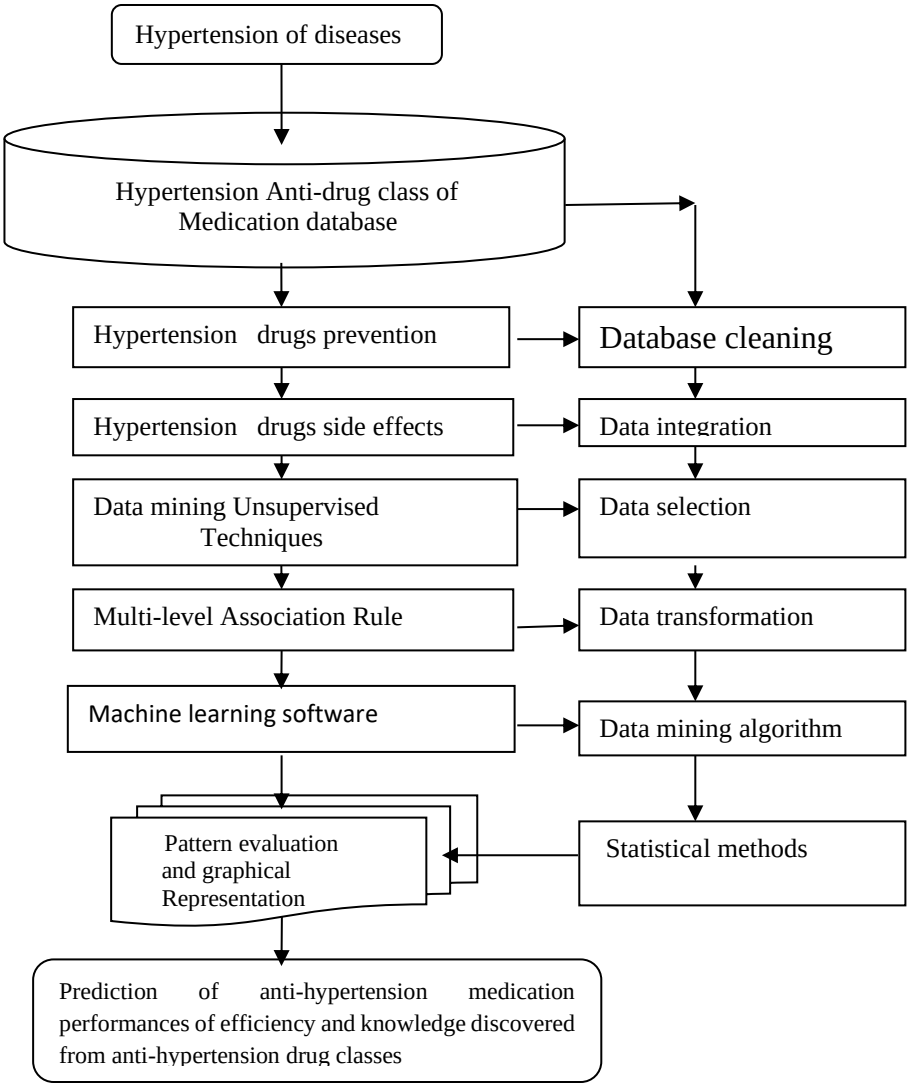


Fig. 2: Data mining process for knowledge discovery in anti-hypertensive drugs of Support, Confidence and Correlation Analysis

Anti-Hypertension medication performance in prevention and side effects of diseases relationship efficiency analysis in data mining multilevel association rule based and this research method of

interpretation and evaluation knowledge discovery system will be lead clear understanding about the anti- hypertensive drug classes performance of efficiency and anti-hypertension drugs of prevention with side effects analysis system and this method will be useful to Medical, Nursing, Pharmaceutical subdivision of sector and students can be answer new drug design of efficiency of knowledge to treatment of hypertension affected the patients. et al (Kolling, M. L., Furstenau, L. B., Sott, M. K., Rabaioli, B., Ulmi, P. H., Bragazzi, N. L., & Tedesco, L. P. C. 2021) [79].

6. STUDY DESIGN:

6.1 Data Mining Knowledge Discovery:

The data mining KDD process of efficient discovery of non-obvious valuable patterns from a large collection of data and data mining techniques uses to extraction of hidden predictive information from large database. Data mining aspects is improving the quality of decision-making process in pharma industry.

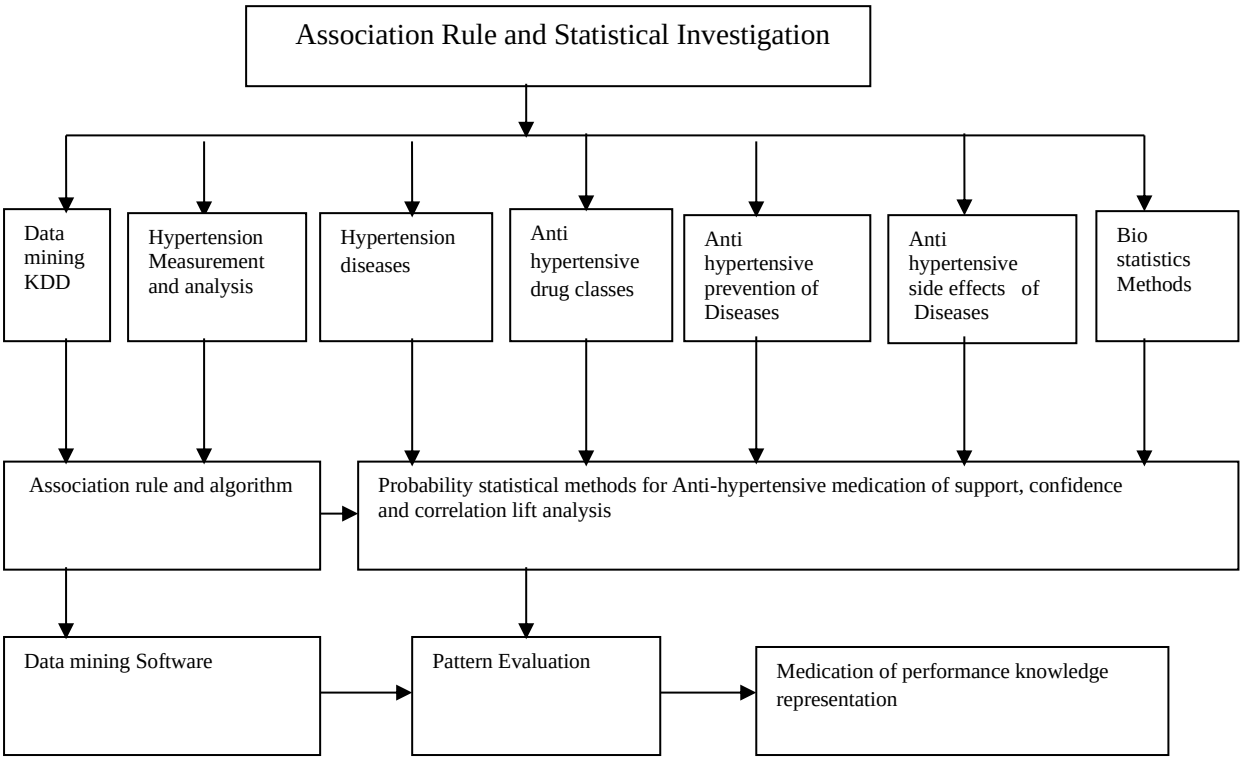


Fig. 3: Study design process for prediction of anti-hypertensive drugs classes efficiency.

6.2 Methodology and Techniques processing:

Data mining association rule mining techniques using with Orange software to prediction of anti-hypertension drugs classes of efficiency in hypertension prevention and side effects diseases, here below the following steps are necessary.

Step 1: **File connection**: To import the CSV file format dataset into Orange software

Step 2: **Frequently occurrence of datasets:** To prepare the data base table structure, Anti - Hypertension drugs classes, Hypertension prevention diseases and Hypertension side effects diseases.

Step 3: **Association rule mining:** To prediction of anti-hypertension drugs classes of efficacy, analysis with association rules of support, confidence and lifts probability of statistical methods.

Step 4: **Prediction:** To analysis the anti-hypertension drug's efficacy, Association relationships of lifts value, if [lift >1] positive correlation, if [lift =1] no correlation, if [lift <1] negative correlation

Step 5: **Graphical representation:** To visualization of drugs efficiency, drugs prevention and side effects association relationship prediction in Bar chart. Prediction

6.3 Orange software work flow diagram:

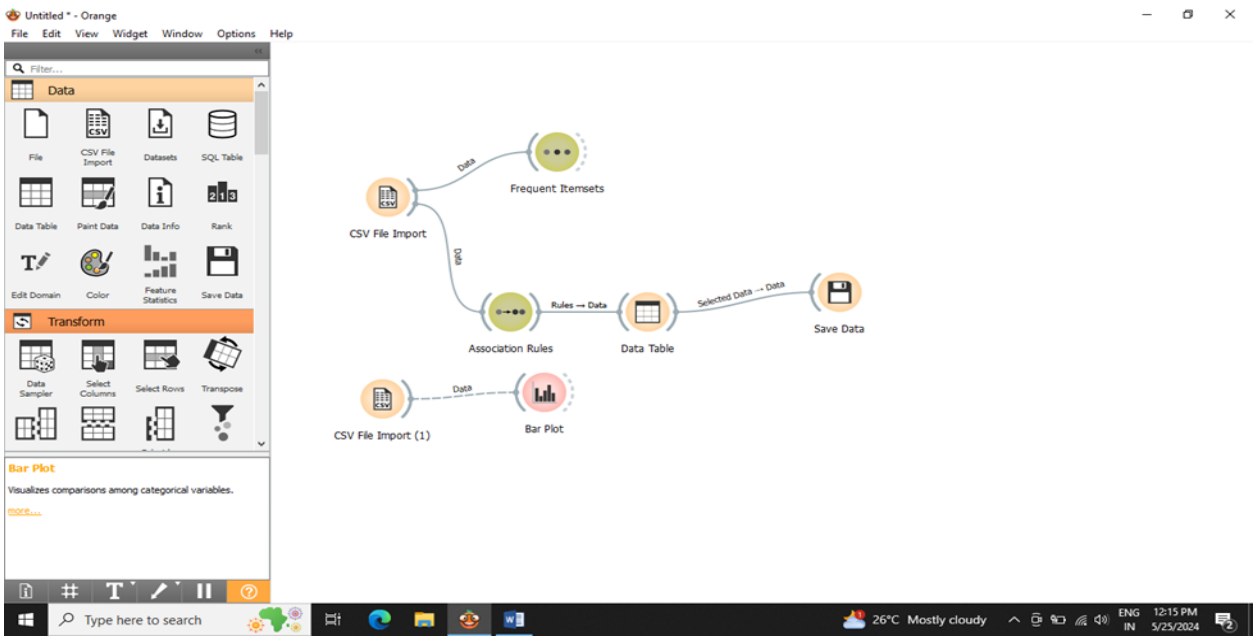
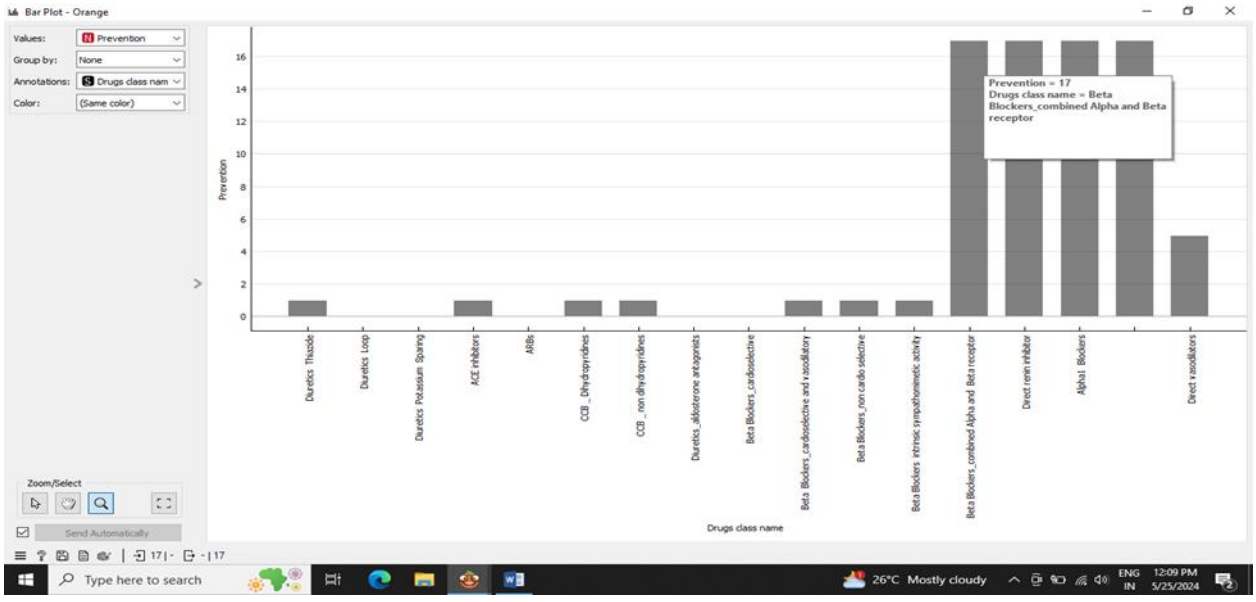


Figure – 4 Orange software process

6.4 Bar Plot:



Graph 1: Graphical representation

Data mining association rules of support, confidence and lifts values in anti-hypertension drugs classes prevention diseases, side effects diseases of efficiency prediction and analysis with Orange software.

6.5 Hypertension or Blood pressure:

The blood pressure is the pressure of the blood within the arteries. It is produced primarily by the contraction of the heart muscle. Its measurement is recorded by two numbers. First ssystolic pressure, which is the initial and highest reading, is obtained after the heart contracts, before the heart contracts, the second (diastolic pressure) is measured, and it is at its lowest. The measurement of the pressure is done with a pressure gauge. Hypertension is the term for an increase in blood pressure. MedicineNet Inc medical dictionary represented the hypertension function of picture below Figure - 5.

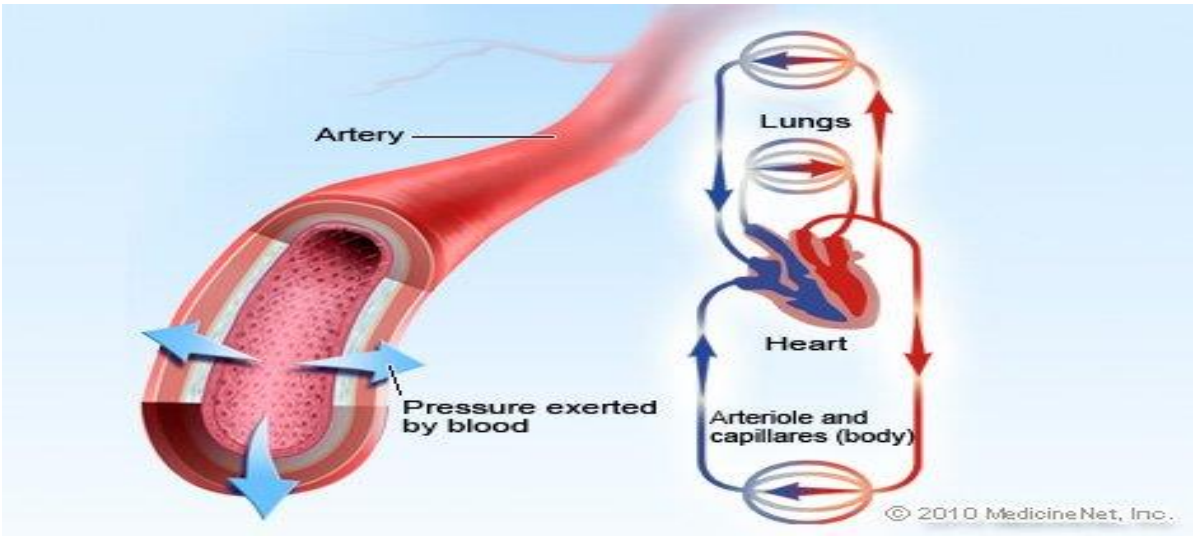


Fig. 5: Blood Pressure Function

If blood pressure is extremely high, there may be certain symptoms to look out for, including: Severe headache. Fatigue (weakness) or confusion. Vision problems. Chest pain. Difficulty breathing. Irregular heartbeat. and if high blood pressure is left ignored, signs like blood in the urine can develop into dangerous illnesses. including Stroke, Heart diseases, Kidney failure and eye problems. et al (Egan, B. M., Kjeldsen, S. E., Grassi, G., Esler, M., & Mancia, G. 2019) [32] and (Prenissl, J., Manne-Goehler, J., Jaacks, L. M., Prabhakaran, D., Awasthi, A., Bischops, A. C. & Geldsetzer, P. 2019) [33]. Maximum blood pressure or Systolic and Minimum pressure or diastolic blood pressures represent the pressures within the blood vessels during different parts of the cardiac cycle. Accurately measuring both of these values is important in diagnosing and managing hypertension. MedicineNet Inc medical dictionary represented the hypertension diagnosis of picture below Figure – 6.

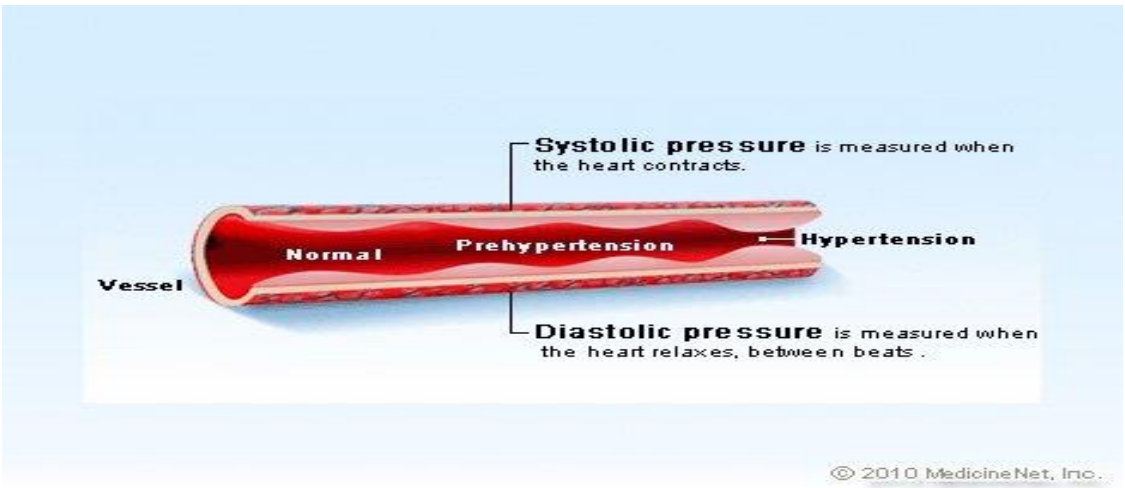


Fig. 6: Blood Pressure Diagnosis

The pressure exerted by blood flowing through arteries is not constant but is dynamic, and constantly reflects, what the heart is doing right now. A phenomenon known as "systole" occurs when the heart is actively beating, it is ejecting blood out into the arteries. An increase in intravascular pressure results from this dynamic ejection of blood into the arteries. Systolic blood pressure is defined as the highest blood pressure recorded during an active cardiac contraction. The pressure that the blood exerts in the arteries between heartbeats, or when the heart is not actively pumping blood into the arteries, is known as diastolic blood pressure. The cardiac ventricles briefly relax after the heart has completed contracting to allow blood to replenish them in advance of the subsequent contraction. "Diastole" refers to this time of ventricular relaxation, and the blood pressure measured during diastole is known as the diastolic

blood pressure. et al (Tsimploulis, A., Sheriff, H. M., Lam, P. H., Dooley, D. J., Anker, M. S. Papademetriou, V., & Ahmed, A. 2017) [34].

6.6 Hypertension or Blood Pressure Analysis:

A blood pressure (BP) consists of two numbers. Systolic BP = Larger (first) number and Diastolic BP = Smaller (second) number. These 2 forces are each represented by a series of values in an arterial pressure measurement. American Heart Association represented below represented this chart for prediction of human blood pressure which one is a systolic pressure (the top number) of less than 120 millimetres Hg and a diastolic pressure (the bottom number) of less than 80 mm Hg, Elevated blood pressure, Hypertension stage1, Hypertension stage2 and Hypertension crisis analysis through systolic and diastolic measurement based identified hypertension level in our body. For example, if blood pressure reading is 130-139/80 - 89 millimetres of mercury (mm Hg), this is stage 1 hypertension such that reading consider is increased chance of cardiovascular illness.

Table 1: Analysing arterial pressure

Arterial Pressure Category	Systolic mmHg (upper number)	Diastolic mmHg (lower number)
Normal	Less than 120	Less than 80
Elevated	120 - 129	Less than 80
High Blood Pressure (Hypertension Stage 1)	130 - 139	80 - 89
High Blood Pressure (Hypertension Stage 2)	140 or Higher	90 or Higher
Hypertensive crises (Very serious stage)	Higher than 180	Higher than 120

The American Heart Association has identified five blood pressure ranges, which are as follows: Normal-healthy, Elevated, Hypertension stage 1, Hypertension stage 2 and Hypertensive crisis

1. Healthy:

Less than 120/80 mm Hg is regarded as being within the normal range for blood pressure measurements. If this is the case with your results, continue with heart-healthy practices such as eating a balanced diet and exercising on a regular basis.

2. Elevated:

A consistently high blood pressure reading falls between 120- and 129-mm Hg at the systolic and less than 80 mm Hg at the diastolic levels. Individuals who have high blood pressure are more likely to develop high blood pressure if they don't take action to manage their condition.

3. Hypertension Stage 1:

Stage 1 hypertension is defined as a continuous measurement of blood pressure between 130 and 139 systolic or 80- and 89-mm Hg diastolic. Depending on your risk of atherosclerotic cardiovascular disease (ASCVD), which includes heart attacks and strokes, doctors may recommend blood pressure medication at this stage of high blood pressure in addition to lifestyle modifications.

4. Hypertension Stage 2:

Stage 2 hypertension is defined as blood pressure variations that are constantly 140/90 mm Hg or above. At this stage of hypertension, doctors would probably advise a combination of lifestyle changes and blood pressure medication.

5. Hypertensive crisis:

A doctor's intervention is necessary for this stage of hypertension. Give five minutes to calm down before taking another blood pressure reading if it unexpectedly rises above 180/120 mm Hg. This stage is referred to as a hypertensive crisis, if readings are still abnormally elevated and when a person has a blood pressure reading greater than 180/120 mm Hg and exhibits symptoms that could indicate organ damage, such as trouble speaking, chest pain, shortness of breath, back pain, numbness or weakness, or changes in vision.et al (Agarwal, R. (2017) [35]. Hypotension, or low blood pressure, is when there is insufficient blood flow via the arteries and veins, resulting in symptoms or signs. Vital organs including the heart, brain, and kidney suffer from abnormal function and may sustain temporary or permanent damage when blood flow is insufficient to provide sufficient oxygen and nutrients to them.

6.7 Hypertension of diseases:

Numerous conditions, including heart attacks, heart failure, strokes, kidney illnesses, vision loss, and sexual dysfunction, can be caused by hypertension and harm the human body. It is possible to prevent the consequences of abnormal blood pressure. or reduced if it's treated early and kept under control. American Heart Association efforts to improve healthy choices related to living with high blood pressure. American Heart Association, represented the hypertension diseases of picture below Figure – 7.

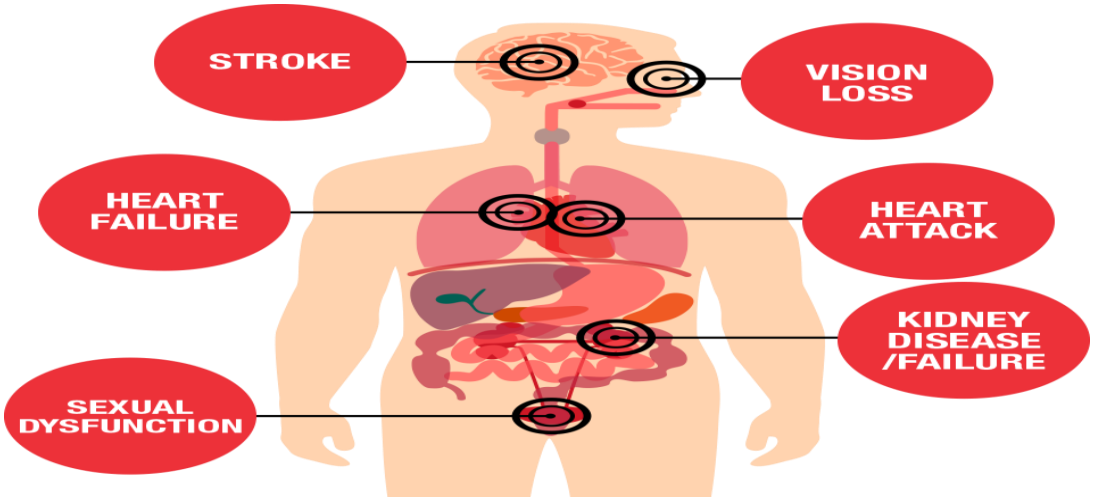


Fig. 7: Hypertension of diseases

Hypertension can be led to some serious diseases are **Heart attack** : A blockage in the arteries caused by high blood pressure might stop blood from reaching the heart muscle. **Stroke:** Blood arteries in the brain may obstruct or even burst frequently as a result of high blood pressure. **Heart failure** : Elevated blood pressure can lead to an enlarged heart that is unable to pump blood to the body. **Kidney disease or failure** : An excessive arterial pressure level can harm the kidneys' surrounding arteries and impair the kidneys' capacity to filter blood efficiently.et al (Chaudhuri, A. K., Ray, A., Das, A., Chakrabarti, P., & Banerjee, D. K. 2020) [77]. **Vision:** Blood vessels in the eyes may get strained or damaged by high blood pressure. **Sexual dysfunction :** Elevated blood pressure may result in decreased libido in women or erectile dysfunction in males. Hypertension is called a "silent killer". Most populace with hypertension is unaware of the problem because it may have no warning signs or symptoms. Because of this, it is imperative that blood pressure be checked on a frequent basis. Untreated hypertension can lead to serious diseases, including Kidney diseases, Heart attacks, Chest pain, irregular heartbeats, Stroke, Lower blood pressure, Coronary artery diseases, Diabetes, Migraines, Liver failure, Shortness of breath, Swelling, central serous retinopathy, Scleroderma, Glaucoma , Anxiety diseases, Temors, Hyperthyroidism, Tissue swelling, Drug withdrawal and hot flashes in menopause. Hypertension and diabetes are the silent killer diseases worldwide and main risk factor for numerous illnesses, including as a a cardiovascular diseases, stroke, renal diseases, et al(Cheng, S., Lichtman, J. H., Amatruda, J. M., Smith, G. L. Mattera, J. A., Roumanis, S. A., & Krumholz, H. M. 2005) [28],(Prenissl, J., Manne-Goehler, J., Jaacks, L. M., Prabhakaran, D., Awasthi, A., Bischops, A. C. & Geldsetzer, P. 2019) [33] and (Ettehad, D., Emdin, C. A., Kiran, A., Anderson, S. G., Callender, T., Emberson, J. & Rahimi, K. 2016) [36].

7. ANTI-HYPERTENSIVE OF MEDICATIONS:

The therapeutic goal of anti-hypertensive medications is to prevent, regulate, or treat hypertension. They belong to multiple classes of chemical. The structural and functional characteristics of the various antihypertensive medication classes vary. Anti-hypertensive medication is available in different each pros and cons in pharmacy.et.al (Jackson. E., & Bellamy, M. C. 2015) [37].

7.1 Diuretics:

Among the medications most frequently used to treat high blood pressure are diuretics. They aid in the kidneys' removal of extra salt and water. As a result, less blood must flow through your blood vessels, lowering your blood pressure. Potassium-sparing, loop, and thiazide diuretics are the three main categories of diuretics. In general, thiazide diuretics have fewer negative effects than the other types. This is particularly the case when taken at the modest dosages typically used to treat hypertension in its early stages. et al (Armstrong C, 2014) [38], (Roush, G. C., Kaur, R., & Ernst, M. E. 2014) [39], (Ellison, D. H. 2019) [40] and (Huxel, C., Raja, A., & Ollivierre-Lawrence, M. D. 2023) [41].

7.2 Angiotensin converting enzyme inhibitors:

Angiotensin converting enzyme inhibitors, or ACE inhibitors, prevent the body from producing angiotensin II, a hormone that narrows blood arteries. By encouraging narrowed blood arteries to widen and allow more blood to pass through, these drugs reduce blood pressure. et al (Herman, L. L., Padala, S. A., Annamaraju, P. & Bashir, K. 2017) [42].

7.3 ARBs:

Blockers of the angiotensin II receptor additionally, this class of medications guards against angiotensin II damage to the blood vessels. Angiotensin II has to attach to a receptor site in order to constrict blood vessels. That is prevented by ARBs. The outcome is a reduction in blood pressure. et al (Armstrong, C. 2014) [38].

7.4 Calcium channel blockers dihydropyridines:

All muscles require calcium to enter and exit the muscle cells in order to move. Calcium channel blockers aid in preventing calcium from entering the heart's and blood vessels' smooth muscle cells. This helps blood arteries relax and reduces the force with which the heart beats. Blood pressure consequently drops. a calcium channel blocker used to treat angina and hypertension. et al (Rimoldi, S. F., Messerli, F. H., Chavez, P., Stefanini, G. G., & Scherrer, U.2015) [43],(Farzam, K., & Jan, A. 2023)[44] and (Pollack, C. V., Varon, J., Garrison, N. A., Ebrahimi, R., Dunbar, L., & Peacock IV, W. F.2009)[64].

7.5 CCB - non dihydropyridines:

A non-dihydropyridine calcium channel blocker applied in the treatment of angina, arrhythmia, and hypertension. Reducing the force of contraction of the myocardium is known as the negative inotropic effect of **calcium channel blockers**. The class of CCBs known as **dihydropyridines** mainly affect arterial vascular smooth muscle and lower blood pressure by causing vasodilation. The non-dihydropyridine CCBs such as **verapamil** (Isoptinā) and **diltiazem** (Cardizemā) cause less vasodilation and more cardiac depression than dihydropyridine CCBs. They have negative effects at the SA and AV nodes, and cause reductions in heart rate and contractility.et al (Rimoldi, S. F., Messerli, F. H., Chavez, P., Stefanini, G. G., & Scherrer, U.2015) [43] and (Farzam, K., & Jan, A. 2023) [44].

7.6 Diuretics-Aldosterone Antagonists:

Diuretics, sometimes known as "water pills," are aldosterone antagonists. Another name for them would be aldosterone receptor blockers. These medications treat heart failure and elevated blood pressure. They accomplish this by encouraging the kidneys to generate more urine. The body expels more extra salt and water when it urinates more. This makes the heart pump more easily. Aldosterone is a substance that is blocked by aldosterone receptor antagonists. The human body retains less fluid as a result of this process, which helps to lower blood pressure. et al (Bazoukis, G., Thomopoulos, C., & Tsioufis, C. 2018) [45], (Chapman, N., Dobson, J., Wilson, S., Dahlöf, B., Sever, P. S., Wedel, H., & Poulter, N. R. 2007) [46] and (Khosla, N., Kalaitzidis, R., & Bakris, G. L. 2009) [47].

7.7 β-Blockers – cardio selective:

Medications that lower blood pressure are referred to as beta blockers, or beta-adrenergic blocking agents. Epinephrine, or adrenaline, is a hormone whose actions are blocked by beta blockers. Blood pressure is lowered by beta blockers because they induce your heart to beat more slowly and with less

force. In order to increase blood flow, beta blockers also aid in vein and artery opening. et al (Farzam, K., & Jan, A. 2023) [44].

7.8 β-Blockers - cardio selective and vasodilatory:

Beta-blockers are important agents in cardiovascular medicine, proving critically essential to lowering cardiovascular risk and managing heart failure and hypertension. The antihypertensive efficacy of the novel, highly cardio selective beta-blocker nevivolol is comparable to that of conventional beta-blockers, but its tolerability is superior to that of previous medicines, its permitted nebivolol to be used more widely and effectively than other beta-blockers. et al (Farzam, K., & Jan, A. 2023) [44] and (Weiss, R. 2006) [48].

7.9 β-Blockers - non cardio selective:

Non-cardio selective beta blockers may be dangerous, particularly in people with respiratory disorders such chronic obstructive pulmonary disease, as they can cause severe bronchial constriction. Non-cardio selective beta blockers, like propranolol or nadolol, helps minimize arrhythmias, blood pressure, heart rate, and the workload on the heart diseases. et al (Turner, G. G., Nelson, R. R., Nordstrom, L. A., Diefenthal, H. C., & Gobel, F. L. 1978) [49] and (Hayes, P. C., Bouchier, I. A. D., Davis, J. M., & Lewis, J. A. 1990) [50].

7.10 β-Blockers ISA:

Treatment of hypertension may soon involve the use of a novel class of beta-adrenergic blockers possessing the pharmacologic characteristic of intrinsic sympathomimetic action. While maintaining resting heart rate and cardiac output, these medicines lower blood pressure and systemic vascular resistance. et al (Frank, J. R., Mungroo, R., Ahmad, Y., Wang, M., De Rossi, S., & Horsley, T. 2010) [51].

7.11 β - Blockers - combined α- and β-receptor:

The combined impact of alpha-beta blockers. They inhibit catecholamine hormones' ability to attach to alpha- and beta-receptors. As a result, similar to how alpha-blockers work, they may reduce blood vessel constriction. They have the same effect as beta-blockers in that they lessen heart rate and force. Alpha-beta blockers include labetalol (Normodyne, Trandate) and carvedilol (Coreg). et al (do Vale, G. T., Ceron, C. S., Gonzaga, N. A., Simplicio, J. A., & Padovan, J. C. 2019) [52].

7.12 Direct renin inhibitor:

Direct renin inhibitors are a more recent kind of blood pressure medicine (DRIs). These medications inhibit renin, a substance found in human body. Blood vessels will widen as a result of this process, lowering blood pressure. As of this now, the only kind of DRI that is offered in the US is aliskiren (Tekturna). et al (resin, Y., Taylor, A. A., Kilo, C., Tschöpe, D., Santonastaso, M., Ibram, G. & Satlin, A. 2007) [53].

7.13 α1-blockers:

α1-blockers produces hormones known as catecholamines under specific conditions. Alpha-receptors are regions of cells that these hormones have the ability to attach to heartbeat becomes more vigorous and rapid as a result of blood vessels narrowing. Blood pressure rises as a result of these activities. When catecholamines bind to alpha-receptors, alpha-blockers prevent this binding from occurring. The consequence is a normal heartbeat and increased blood flow via the blood vessels. This can reduce your blood pressure by doing this. Triazosin (Hytrin), prazosin (Minipress), and doxazosin (Cardura) are a few examples of alpha-blockers.

7.14 Central α1-agonist and other centrally acting drugs:

These drugs prevent the neurological system from receiving signals from the brain instructing it to release catecholamine. Blood flows more readily and the heart pumps less forcefully as a result, decreasing blood pressure. Among the central agonists are methyldopa include: (Aldomet), clonidine (Catapres) and guanfacine (Tenex). et al (Bakris, G. L., Sica, D., White, W. B. Cushman, W. C., Weber,

M. A., Handley, A & Kupfer, S. 2012) [54] and (Severino, P., D'Amato, A., Netti, L., Pucci, M., Mariani, M. V., Cimino, S. & Fedele, F. 2021) [55].

7.15 Direct vasodilators:

Particularly in tiny arteries known as arterioles, vasodilators ease the musculature of blood vessel walls. Because of this, blood can pass through the blood vessels more readily and widely. Blood pressure decreases as a consequence. Vasodilators' instances. include: hydralazine (Apresoline) and minoxidil (Loniten).et al (Lindner, A., Fornadi, K., Lazar, A. S., Czira, M. E., Dunai, A., Zoller, R. & Molnar. M. Z. 2012) [56] and (Takin, J. M., & Kaski, J. C. 2018) [57].

8. ANTI HYPERTENSIVE MEDICATION OF SIDE EFFECTS:

There is a wide range of antihypertensive medications (blood pressure lowers) on the market. Given the circumstances, the doctor will choose the best medication or a combination of medications after weighing the advantages and disadvantages of each. Maintaining appropriate blood pressure regulation is crucial to averting cerebrovascular or cardiovascular incidents. Most of the time, need to get blood pressure checked constantly. Although there may be some adverse effects from antihypertensive medications, these are frequently treatable with dosage adjustments or medication substitutions. Most blood pressure anti-hypertensive or medicines are easy to take, but all medicines have side effects and most of these are mild and may go away over time. Medication for high blood pressure frequently causes the following negative effects: include: **Diuretics:** Urinary frequency and dizziness. **ACE** inhibitors and **ARB** Angiotensin II receptor antagonists generally not recommended during pregnancy and may lead to fetus kidney damage, growth problems, or dizziness. even death. **Calcium channel blockers:** dizziness and headache**. Beta-blockers:** fatigue, nausea and diarrhea, sluggish heartbeat, cold hands and feet, and irregular sleep patterns. **Alpha-blockers** and **centrally acting antihypertensive medications:** headache, dry mouth, and vertigo. Vasodilator**:** Vasodilators always cause headache, nausea, and vomiting Antihypertensive medications should only be taken as preventative measures under a Doctor's and pharmacist's review of supervision et al. (www.drugoffice.gov.hk.2020).

9. BIO STATISTICS AND COMPUTER APPLICATION IN PHARMACY:

Statistics well-defined as the collection, classification, presentation, numerical data interpretation and analysis. The term "bio statistics" refers to the use of statistical methods to data originating from biological disciplines, including medicine.et al (Birjandi, S. M., & Khasteh, S. H. 2021) [81]. Bio informatics is the development, application, and use of statistical and mathematical approaches that enable information to be gained from medical data. Results are made available to the public and individual medical specialties through appropriate presentations and statistically sound interpretations. The science of methodically creating, organizing, storing, processing, and distributing data, information, and knowledge in the medical and healthcare industries is known as medical informatics. The computer has become a very common tool in all areas of science and technology. The field of pharmacy has immensely benefited by use of computer in new drug discovery, drug design analysis, manufacturing of drugs, hospital pharmacy and research work.et al (Gore, A. D., Kadam, Y. R., Chavan, P. V. & Dhumale, G. B. 2012) [58].

10. ASSOCIATION RULES:

An association rules is an implication expression of the form $X \rightarrow Y$, Where X and Y are disjoint item sets, $X \cap Y = \varphi$. An association rule's reliability can be evaluated in terms of its confidences and support. A rule's confidences indicate whether or not items in Y appear in transactions that contain X, while support indicates how frequently a rule is applicable to a particular dataset.

$$\text{Support, s } (X \rightarrow Y) = \frac{\sigma(XUY)}{N}$$

$$\text{Confidence, c } (X \rightarrow Y) = \frac{\sigma(XUY)}{\sigma(X)}$$

Support is frequently used to eliminate uninteresting rules, it is a crucial metric to have because a rule with very low support might arise by chance. Additionally, support has a desired property that can be used to efficiently uncover association rules. Confidence quantifies the validity of the deduction drawn by a rule for a certain rule X → Y the greater the confidence, the greater the probability that Y will occur in a transaction that contains X. Additionally, estimations of the conditional likelihood of Y given X are provided by confidence. Data mining Association Rule Discovery is defined a specified a set of transactions T, find all the rules with confidence ≥minconf and support >= minsup, where minsup and minconf are the respective confidence and support requirements. et al (Savasere, A., Omiecinski, E., & Navathe, S. 1995) [13]. Association rules are produced by mining data at many levels of abstraction. Using concept hierarchies under a support-confidence framework with general, a top-down strategy is used to mine multilevel association rules efficiently. At each concept level, counts are accumulated for the calculation of frequent item sets, starting at concept level one and moving down the hierarchy toward the more specific concept levels until no more frequent item sets are found. At each level, any algorithm for finding frequent item sets, such as Apriori or its variations, may be used. et al (Han, J., & Fu, Y.1995) [14]. One crucial component of issue solving in various kinds of huge databases is association rule mining. Finding connections or associations between particular values of categorical variables in sizable data sets is the aim of association rule mining. This is a typical data mining project work. Assuming I is a collection of objects and Data is a collection of transactions, the association rule follows from the form. X=>Y, wherein X and Y are non-overlapping subsets of I. There are two metrics for every rule: confidence and support. Mining associations' rules defined as find all the rules $X \rightarrow Y$ *with* minimum support and confidence in transaction in large database. et al (Liu, B., Hsu, W., & Ma, Y. 1999) [15].

support, *s*, probability that a transaction contains X ∪ Y

$$s = P(X \cup Y) = \textit{support count}(X \cup Y) / \textit{number of all transactions}$$

confidence, *c*, conditional probability that a transaction having X also contains Y

$$c = P(X|Y) = \textit{support count}(X \cup Y) / \textit{support count}(X)$$

A form's implied expression X → Y, where X and Y are item sets

Rule Evaluation Metrics in association rule mining

Support (s) is the percentage of transactions that have both X and Y in them.
Confidence (c) is the frequency with which an item within Y appears in transactions containing X is measured by confidence (c).

10.1 Multi level association rule generation:

A set of transactions T, finding all rules with support ≥ minsup threshold and confidence ≥ minconf threshold, which are considered to be strong of the aim of association rule mining. et al (Kajal, A., & Kajal, I. 2012) [16].

Itemset X = $\{x_1, \ldots, x_k\}$
The correlation rule of association $X \rightarrow Y$
support, *s*, possibility of a transaction includes X ∪ Y
Support (X=>Y) = P(XUY) / T
confidence, *c*, conditional probability that a transaction having X also contains *Y*
Confidence (X=>Y) = P(Y/X) = P(XUY) /P(X)

Concept hierarchies and the support and confidence framework of the top-down technique can be used to mine multi-level association rules. There are other variations that use minimum support at all levels. Customers basically need to specify one number for minimum support, consuming reduced minimum support at lower levels, so the search process is simplified by avoiding the examination of item sets that previously did not include minimum support. Each stage has a minimum support of its own, and the threshold value decreases as the level becomes deeper. Utilizing a minimum support threshold based

on an item or group can be set by grouping items based on other attributes and low support threshold can be set for an item of interest and redundant rules are generated due to ancestor relationship. et al (Souza, V. S., & Lima, D. A. 2023) [78].

10.2 Data mining -Apriori algorithm:

Mining frequent item sets and creating association rules from transactional databases are done with the Apriori algorithm.
The parameters "support" and "confidence" are used. **Support** refers to items' frequency of occurrence; **confidence** is a conditional probability.
Apriori algorithm: The following are the main steps of the algorithm:

1. Calculate the support of item sets (of size k = 1) in the transactional database (note that support is the regularity with which an item set occurs). This is called *generating the candidate set*.
2. Prune the candidate set by eliminating items with a support less than the given threshold.
3. Form sets of size k + 1 by joining the frequently occurring item sets.and repeat the above sets until no more item sets can be formed. This will happen when the set(s) formed have a support *less than* the given support.

11. DATA COLLECTIONS:

The term "hypertension" describes a continuous, sustained increase in blood pressure above normal. If left untreated, hypertension can lead to serious side effects such kidney failure, coronary heart disease, and stroke. Patients with hypertension must take antihypertensive drugs on a long-term basis. American heart association and Stroke association represented Antihypertensive drugs that are commonly used can be classified into the following categories:

11.1 Anti-hypertensive Medication Sample Data Collection:

Table 2: Anti hypertension drugs classes process

Sl. No.	Agent Class	Drugs	Usual Dose, Range (mg per day)*	Daily Frequency	Observations
1	**Diuretics / Thiazide**	Chlorthalidone	12.5-25	1	* Chlorthalidone preference based on prolonged half-life and proven trial reduction of CVD • Monitor for hyponatremia and hypokalemia, uric acid and calcium levels • Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy
		Hydrochlorothiazide	25-50	1	
		Indapamide	1.25-2.5	1	
		Metolazone	2.5-10	1	
2	**Diuretics - loop**	Bumetanide	0.5-4	2	* Preferred diuretics in patients with symptomatic heart failure • Preferred over thiazides in patients with moderate-to-severe chronic kidney disease (eg, GFR <30 mL/min)
		Furosemide	20-80	2	
		Torsemide	5-10	1	
3	**Diuretics - Potassium Sparing**	Amiloride	5-10	1 or 2	* Monotherapy agents minimally effective antihypertensive • Combination therapy of potassium-sparing diuretic with a thiazide adopted in patients within hypokalaemia on thiazide monotherapy • Avoid in patients with significant
		Triamterene	50-100	1 or 2	

					chronic kidney disease (eg, GFR <45 mL/min)
4	**ACE inhibitors**	Benazepril	10-40	1or2	* Do not use in combination with ARBs or direct renin inhibitor • Increased risk of hyperkalaemia, especially in patients with chronic kidney disease or in those on K+ supplements, or K+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ACE inhibitors • Avoid in pregnancy
		Captopril	12.5-150	2 or 3	
		Enalapril	5-40	1 or 2	
		Fosinopril	10-40	1	
		Lisinopril	10-40	1	
		Moexipril	7.5-30	1 or 2	
		Perindopril	4-16	1	
		Quinapril	10-80	1 or 2	
		Ramipril	2.5-10	1 or 2	
		Trandolapril	1-4	1	
5	**ARBs**	Azilsartan	40-80	1	* Do not use in combination with ACE/direct renin inhibitors • Increased risk of hyperkalaemia in kidney disease or in those on K+ supplements or K+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ARBs; patients with a history of angioedema with an ACE inhibitor can receive an ARB beginning 6 weeks after ACE inhibitor discontinued • Avoid in pregnancy
		Candesartan	8-32	1	
		Eprosartan	600-800	1or2	
		Irbesartan	150-300	1	
		Losartan	50-100	1or2	
		Olmesartan	20-40	1	
		Telmisartan	20-80	1	
		Valsartan	80-320	1	
6	**CCB-dihydropyridines**	Amlodipine	2.5-10	1	* Those with cardiac failure with a poor ejection fraction should not use this medication. amlodipine or felodipine may be used if required • Associated with dose-related pedal edema, This affects women more frequently than it does males.
		Felodipine	5-10	One	
		Isradipine	5-10	2	
		Nicardipine SR	5-20	1	
		Nifedipine LA	60-120	1	
		Nisoldipine	30-90	1	
7	**CCB-non dihydropyridines**	Diltiazem SR	180-360	2	* Avoid routine use with β-blockers due to increased risk of bradycardia and heart block • Heart failure with a decreased ejection fraction should not be used. • Drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor) • Drug interactions between verapamil and diltiazem (a significant substrate and moderate inhibitor of CYP3A4)
		Diltiazem ER	120-480	1	
		Verapamil IR	40-80	3	
		Verapamil SR	120-480	1 0r 2	
		Verapamil-delayed onset	100-480	1 (in the	

		ER (various forms)		evening)	
8	**Diuretics-aldosterone antagonists**	Eplerenone	50-100	2	* Preferred agents in primary aldosteronism and resistant hypertension • Spironolactone associated with greater risk of gynecomastia and impotence compared to eplerenone • Common add-on therapy in resistant hypertension • Use caution when taking K+ supplements, other diuretics that spare K+-, or if you have severe renal impairment. • Frequently, two daily doses of eplerenone are necessary for sufficient blood pressure reduction.
		Spironolactone	25-100	1	
9	**β-Blockers—cardioselective**	Atenolol	25-100	2	* It is not advised to use β-blockers as first- line treatment unless the patient has heart failure or ischemic heart disease. • recommended for those requiring a β- blocker due to bronchospastic airway disease • Metoprolol succinate and bisoprolol are recommended for those with heart failure who have a low ejection fraction. • Avoid abrupt cessation
		Betaxolol	5-20	1	
		Bisoprolol	2.5-10	1	
		Metoprolol tartrate	100-400	2	
		Metoprolol succinate	50-200	1	
10	**β-Blockers—cardioselective and vasodilatory**	Nebivolol	5-40	1	* Induces nitric oxide-induced vasodilation • Avoid abrupt cessation
11	**β-Blockers—noncardioselective**	Nadolol	40-120	1	* Reactive airway disease sufferers should avoid • Avoid abrupt cessation
		Propranolol IR	160-480	2	
		Propranolol LA	80-320	1	
12	**β-Blockers intrinsic sympathomimetic activity**	Acebutolol	200-800	2	* Avoid generally, particularly in those suffering from heart failure or ischemic heart disease • Avoid abrupt cessation
		Carteolol	2.5-10	1	
		Penbutolol	10-40	1	
		Pindolol	10-60	2	
13	**β-Blockers—combined α-**	Carvedilol	12.5-50	2	* For those suffering from heart failure and decreased ejection fraction,

	and β-receptor				carvedilol is the primary treatment.
		Carvedilol phosphate	20-80	1	
		Labetalol	200-800	2	• Avoid abrupt cessation
14	**Direct renin inhibitor**	Aliskiren	150-300	1	* Avoid using in conjunction with ARBs or ACE inhibitors. • Performance is very extensive in Aliskiren. • higher risk of hyperkalemia in people with chronic kidney disease, K+ supplement users, and K+-sparing medication users • This can result in abrupt renal failure for those suffering from severe bilateral renal artery stenosis. • Avoid in pregnancy
15	**α1-blockers**	Doxazosin	1-8	1	* Associated with orthostatic hypotension, which can occur particularly in elderly people • patients who have concurrent benign prostatic hyperplasia, it could be considered a second-line treatment.
		Prazosin	2-20	2 or 3	
		Terazosin	1-20	1or 2	
16	**Central α1-agonist and other centrally acting drugs**	Clonidine oral	0.1-0.8	2	* Usually used as last option due to serious side effects on the central nervous system, particularly in older persons. • Avoid stopping clonidine suddenly as this could result in a hypertensive crisis; clonidine needs to be weaned to prevent rebound hypertension.
		Clonidine patch	0.1-0.3	1	
		Methyldopa	250-1000	2 weekly	
		Guanfacine	0.5-2	1	
17	**Direct vasodilators**	Hydralazine	50-200	2 or 3	* Link to salt and water retention as well as reflex tachycardia; take with a β- blocker and diuretic
		Minoxidil	5-100	1-3	• Hydralazine linked to drug-induced lupus- like illness at increased dosages • A loop diuretic is necessary when using minoxidil, which is linked to hirsutism and can cause pericardial effusion.

12. ANTI-HYPERTENSIVE DRUGS CLASSES OF PREVENTION AND SIDE EFFECTS:

There are multiple classes of antihypertensive medications applied for the treatment of HTN; the most recommended classes used as first-line for treatment are Thiazide-type diuretics, Calcium channel

blockers, negative effects of angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and antihypertensive medications differ depending on the specific medication. The following transient reactions are examples of common adverse reactions.

Table 3: Anti hypertension drugs classes of medicine prevention and side effects diseases

S.N0	Drugs class name	Drugs name	Prevention	Side effects
1	**Diuretics: Thiazide** **Diuretics: Loop** **Diuretics: Potassium Sparing**	Chlorthalidone, Hydrochlorothiazi deIndapamide, Metolazone, Bumetanide, Furosemide, Torsemide, Amiloride, Triamterene,	High blood pressure, Liver failure, Kidney diseases, Swelling.	Dizziness, Headaches, Sexual problems,
2	**ACE inhibitors**	Benazepril, Captopril, Enalapril, Fosinopril, Lisinopril, Moexipril, Perindopril, Quinapril, Ramipril, Trandolapril	High blood pressure, Heart failure, Heart attacks, Kidney diseases, Coronary artery diseases, Diabetes, Scleroderma, Migraines.	High potassium, Fatigue, Dizziness, Headaches,
3	**ARBs**	Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, Valsartan	High blood pressure, Heart failure, Kidney diseases, Diabetes.	Dizziness, High potassium, Swelling.
4	**CCB-Dihydropyridines**	Amlodipine, Felodipine, Isradipine, Nicardipine SR, Nifedipine LA, Nisoldipine	High blood pressure, Chest pain, Irregular heartbeat.	Constipation, Dizziness, Fatigue, Headache, Nausea, Swelling.
5	**CCB-non dihydropyridines**	Diltiazem SR, Diltiazem ER, Verapamil IR, Verapamil SR, Verapamil-delayed onset ER (various forms),	High blood pressure, Chest pain, Irregular heartbeat, Heart attacks, Kidney diseases, Stroke.	Dizziness, Weakness, Nausea, Constipation, Headache.
6	**Diuretics-aldosterone antagonists**	Eplerenone, Spironolactone	High blood pressure, Shortness of breath, Swelling, Heart failure, Central serous Retinopathy,	Tummy upsets, Nausea, Sexual problems, Dizziness. High potassium.

			Kidney disease.	
7	**β-Blockers—cardioselective**	Atenolol, Betaxolol, Bisoprolol, Metoprolol tartrate, Metoprolol succinate	High blood pressure, Irregular heartbeats, Chest pain, Heart failure, Heart attacks, Glaucoma, Migraines, Anxiety disease, Tremors, Hyperthyroidism.	Dizziness, Weakness, Drowsy, Fatigue, Dry eyes, Headache, Diarrhea, Constipation, Tummy upsets.
8	**β-Blockers—cardioselective and vasodilatory**	Nebivolol	High blood pressure, Irregular heartbeats, Chest pain, Heart failure, Heart attacks.	Headache, Tummy upsets, Shortness of breath, Wheezing, Sudden weight Gain, Dizziness.
9	**β-Blockers—non cardio selective**	Nadolol, Propranolol IR, Propranolol LA	High blood pressure, Irregular heartbeats, Chest pain.	Dizziness, Light headedness, Headache, Fever, Shortness of Breath, Chest pain, Sudden weight Gain, Swelling,
10	**β-Blockers intrinsic sympathomimetic activity**	Acebutolol, Carteolol, Penbutolol, Pindolol	High blood pressure, Irregular heartbeats, Coronary artery Diseases.	Diarrhea , Constipation, Dizziness, Nausea, Headache, Drowsy, Weakness.
11	**β-Blockers—combined α- and β-receptor**	Carvedilol, Carvedilol Phosphate, Labetalol	High blood pressure, Heart failure, Chest pain.	Nausea, Weakness, Headache, Diarrhea, Swelling, Sudden weight Gain, Chest pain, Wheezing, Sexual Problems,
12	**Direct renin inhibitor**	Aliskiren,	High blood pressure, Heart attacks, Kidney diseases,	Diarrhea, Stomach pain, Dizziness, Headache

			Stroke, Lower blood pressure.	
13	**α1-blockers**	Doxazosin, Prazosin, Terazosin	High blood pressure, Kidney diseases, Lower blood pressure.	Dizziness, Nausea, Headache, Sudden weigh gain, Drowsy, Weakness.
14	**Central α1-agonist & other centrally acting drugs**	Clonidine oral, Clonidine patch, Methyldopa, Guanfacine	High blood pressure, Drug withdrawal, Lower blood Pressure, Hot flashes in Menopause.	Dizziness, Drowsy, Stomach pain, Constipation, Nausea, Headache, Fatigue, Sexual problems, Sudden weight Gain, Dry eyes , Fever
15	**Direct vasodilators**	Hydralazine, Minoxidil	High blood pressure, Heart attacks, Strokes, Kidney diseases, Heart failure.	Chest pain, Headache, Nausea, Diarrhea.

Only doctors' prescriptions are accepted for the sale of all antihypertensive medications at licensed dispensaries, and patients must take them as directed by their doctors. et al (Nandennagari, S., Owolabi, O. A., Ogbu, U. M., Ayyub, J., & Annam, P. 2023) [59] and (Leung, A. A., Wright, A., Pazo, V., Karson, A., & Bates, D. W. 2011) [60].

12.1 Anti- hypertension drug classes prevention of performance analysis I:

The framework of the antihypertensive medication preventive efficiency analysis using association rule extraction is shown in the table below. This table structure is exploration of hypertension association relationship of various diseases and different types of anti-hypertension medicine prevention of efficiency in various diseases computation in statistical, probability methods applied for support, confidence and correlation lift computation and analysis for various anti hypertension medicine relationship of efficiency.

The table respect to a transaction database D, Support the frequency (probability) of the entire rule with respect to D

$support(X \Rightarrow Y) = P(X \cup Y) = \{T \in D | X \cup Y \subseteq T\} / D = support(X \cup Y)$

"Probability that a transaction in D contains the item set $X \cup Y$"

Confidence: indicates the strength of implication in the rule

$confidence(X \Rightarrow Y) = P(Y|X) = \{T \in D | X \cup Y \subseteq T\} / \{T \in D | X \subseteq T\} = support(X \cup Y) / support(X)$

"Conditional probability that a transaction in D containing the item set X also contains itemset Y" Rule form: {High blood pressure, kidney diseases} =>{Diabetes} [support, confidence]

Similarity, High blood pressure association with other diseases represented below the table structure.

Table 4: Anti hypertension drug classes of medicine prevention diseases association rule mining process.

S.N0	Drugs class name	Probability of anti-hypertension medication prevention prediction in association rule mining process	Support	Confidence	Correlation lift
1	Diuretics Thiazide	{High blood pressure, Kidney diseases}=>{Diabetes}	0.118	0.200	1.700
2	Diuretics Loop	{High blood pressure, Kidney diseases} => {Heart failure}	0.235	0.400	0.971
3	Diuretics Potassium Sparing	{High blood pressure, Kidney diseases} => {Irregular heartbeat}	0.059	0.100	0.283
4	ACE inhibitors	{High blood pressure, Kidney diseases} =>{Heart attacks}	0.235	0.400	1.133
5	ARBs	{High blood pressure, Kidney diseases} =>{Chest pain}	0.059	0.100	0.283
6	CCB - Dihydropyridines	{High blood pressure, Kidney diseases} =>{Stroke}	0.176	0.300	1.700
7	CCB - non dihydropyridines	{High blood pressure, Kidney diseases} =>{Lower blood pressure }	0.118	0.200	1.133
8	Diuretics-aldosterone antagonists	{High blood pressure, Kidney diseases} => {Coronary artery diseases}	0.059	0.100	0.850
9	β-Blockers-cardio selective	{High blood pressure, Kidney diseases} =>{Migraines}	0.059	0.100	0.850
10	β-Blockers-cardio selective and vasodilatory	{High blood pressure, Kidney diseases} =>{Liver failure}	0.176	0.300	1.700
11	β-Blockers - non cardio selective	{High blood pressure, Kidney diseases} =>{Scleroderma}	0.059	0.100	1.700
12	β-Blockers intrinsic sympathomimetic activity	{High blood pressure, Kidney diseases} =>{Swelling}	0.235	0.400	1.700
13	β-Blockers-combined α- and β-receptor	{High blood pressure, Anxiety diseases }=>{Glaucoma}	0.059	1.000	17.000
14	Direct renin inhibitor	{High blood pressure, Anxiety diseases }=>{Tremors}	0.059	1.000	17.000
15	α1-blockers	{High blood pressure, Anxiety diseases }=>{ Hyperthyroidism}	0.059	1.000	17.000
16	Central α1-agonist & other centrally acting drugs	{High blood pressure, Hot flashes in menopause}=>{Drug withdrawal}	0.059	1.000	17.000
17	Direct vasodilators	{High blood pressure, Hot flashes in menopause }=>{Lower blood pressure}	0.059	1.000	5.667

12. 2 Anti hypertension drug classes side effects performance analysis II:

Anti-Hypertension drug classes of medicine of side effects analysis in association rule mining technique.

Table -5: Anti hypertension drug classes of medicine side effects diseases association rule mining process

S. N0	Drugs class name	Probability of anti-hypertension medication side effects prediction in association rule mining process	Support	Confidence	Correlation lift
1	Diuretics Thiazide	{Dizziness , Headache}=>{Nausea}	0.294	0.385	0.817
2	Diuretics Loop	{Dizziness , Headache}=>{Sudden weight gain}	0.235	0.308	1.046
3	Diuretics Potassium Sparing	{Dizziness , Headache}=>{Weakness}	0.235	0.308	1.046
4	ACE inhibitors	{Dizziness , Headache}=>{Constipation }	0.294	0.385	1.308
5	ARBs	{Dizziness , Headache}=>{Diarrhea}	0.176	0.231	0.785
6	CCB - Dihydropyridines	{Dizziness , Constipation} =>{Swelling}	0.059	0.200	0.850
7	CCB - non dihydropyridines	{Dizziness , Headache}=>{Fatigue}	0.235	0.308	1.308
8	Diuretics-aldosterone antagonists	{Dizziness ,Headache}=>{Drowsy}	0.235	0.308	1.308
9	β-Blockers-cardio selective	{Dizziness ,Weakness}=>{Tummy upsets}	0.059	0.250	1.417
10	β-Blockers-cardio selective and vasodilatory	{Dizziness ,Headache}=>{Tummy upsets}	0.118	0.154	0.872
11	β-Blockers - non cardio selective	{Dizziness , Fever}=>{Chest pain}	0.059	0.500	2.833
12	β-Blockers intrinsic sympathomimetic activity	{Dizziness , Weakness} =>{Drowsy}	0.176	0.750	3.188
13	β-Blockers-combined α- and β-receptor	{Dizziness , Headache}=>{Sexual Problem}	0.235	0.308	0.872
14	Direct renin inhibitor	{Dizziness, Stomach pain}=>{Headache }	0.118	1.000	1.133
15	α1-blockers	{Dizziness , Nausea}=>{Sudden weight gain}	0.118	0.333	1.133
16	Central α1-agonist & other centrally acting drugs	{Dizziness , Drowsy}=>{Nausea}	0.176	0.750	1.594
17	Direct vasodilators	{Headache ,Chest pain}=>{ Nausea}	0.118	0.667	1.417

Rule form: {Dizziness, Headaches} => {nausea} [support, confidence]

Similarity, Dizziness association with other side effects diseases represented above the table structure.

The lift, also referred to as the interestingness measure, takes this into account by incorporating prior probability of the rule consequent as follows:

Lift (X → Y) = Support (X U Y) / Support (X) * Support(Y)
Here X = A and Y = B , both are correlation analysis
Correlation Lift : The two rules A => B and B => A have the same correlation coefficient.
Consider the both P(A) and P(B) in consideration like as
Correaltion A,B > 1 The two items A and B are positively correlated.
Correaltion A,B = 1 There is no correlation between the two items A and B.
Correaltion A,B < 1 The two items A and B are negatively correlated

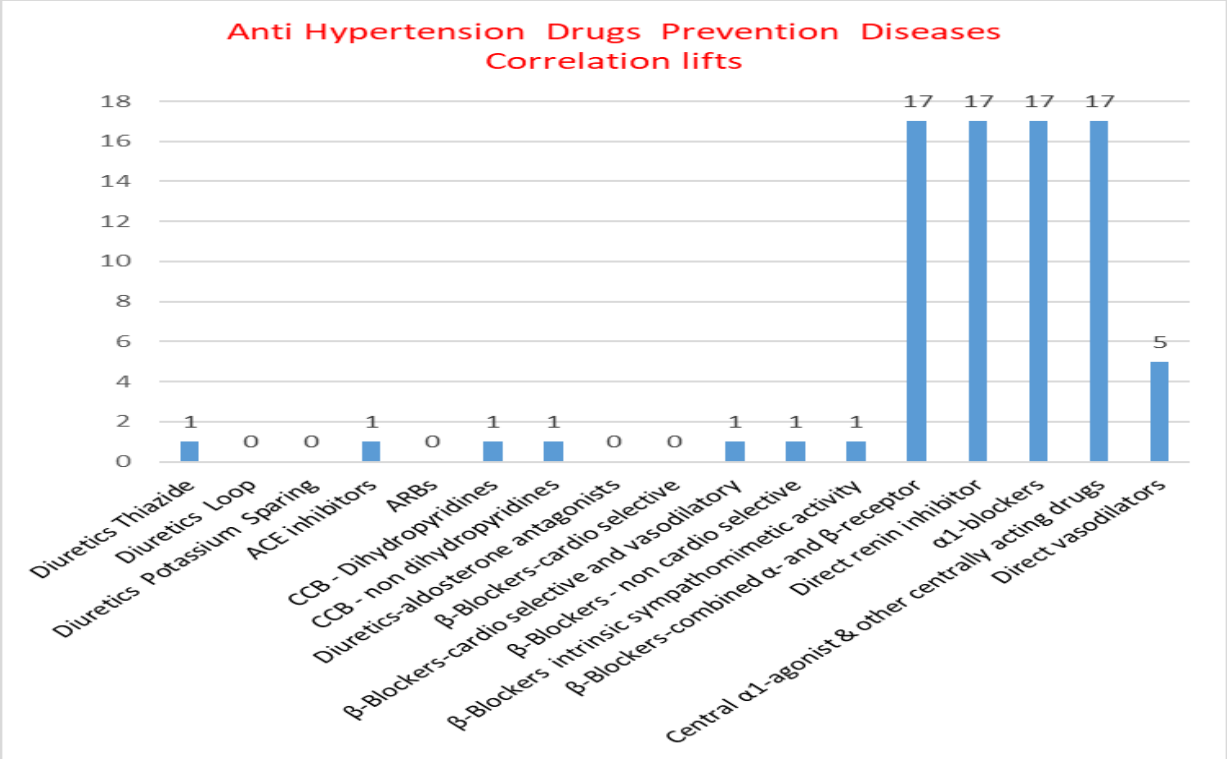
Anti- Hypertension medicine of side effective prediction in data mining association rule algorithm and techniques of support, confidence and correlation lift or interest based identified the anti-hypertension medicine of side effects association strength in relationship from various anti-hypertension medicine classes.

The **lift** of a rule X-->Y is calculated as lift(X-->Y) = ((sup (X U Y)/ N) / (sup(X)/ N*sup(Y)/ N), where, N is the sum of transactions in the transaction database, sup(X∪Y) is the number of transactions containing X and Y, sup(X) is the number of transactions containing X , sup(Y) is the number of transactions containing Y.

13. RESULT AND DISCUSSION:

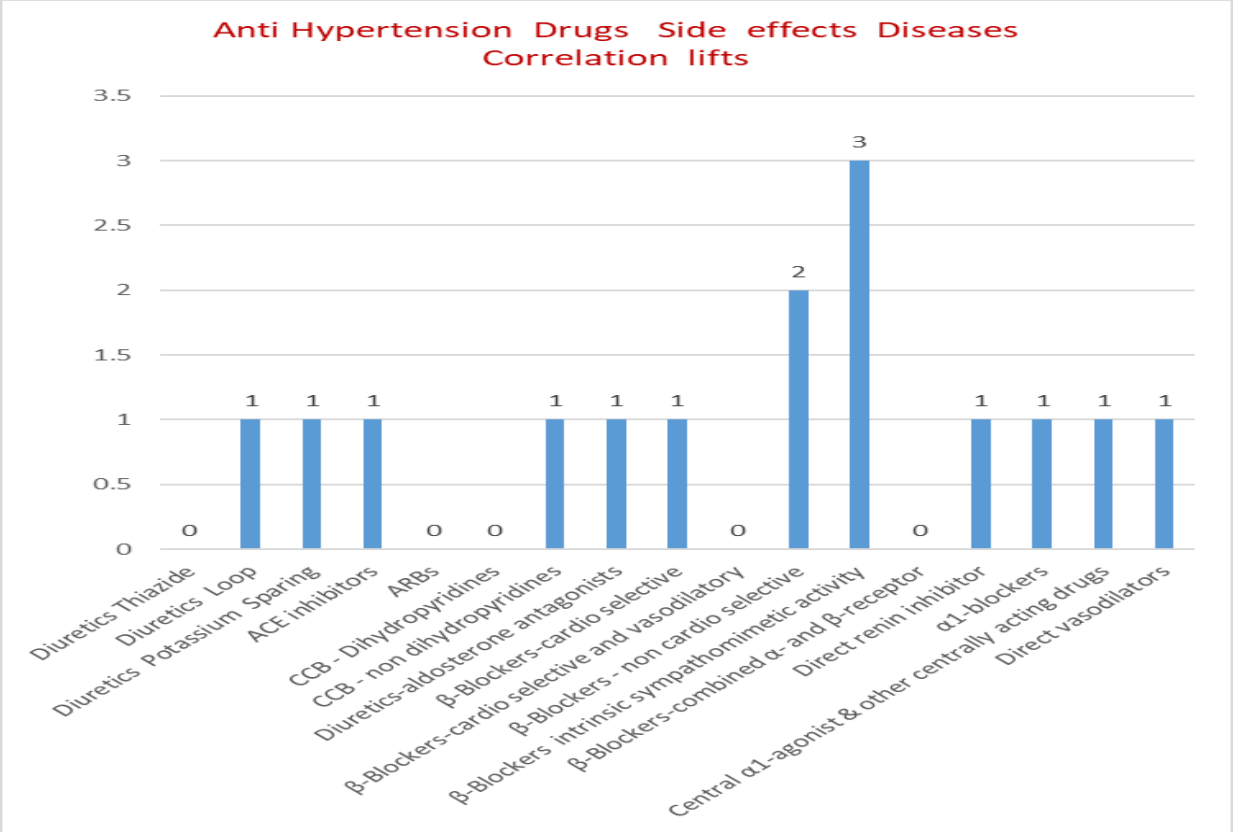
Orange data mining analytical tool helps to identify the strength of association drug performance and Correlation knowledge of anti-hypertension drugs classes in graphical visualization techniques based, this graphical pattern evaluation to help users understand and interpret the data mining result. Data mining association rule of support, confidence and correlation of lift anti-hypertension drugs prevention of efficiency computation values are represented about the ratio of confidence to expected confidence in **Diuretics Thiazide** medicine performance of {High blood pressure, Kidney diseases}=>{Diabetes} this association relationship is no correlation or independent[lift=1]. Similarity, **ACE inhibitors** medicine performance of {High blood pressure, Kidney diseases} => {Heart attacks}. **CCB – Dihydropyridines** medicine performance of {High blood pressure, Kidney diseases} =>{Stroke}.**CCB-non dihydropyridines** medicine performance of {High blood pressure, Kidney diseases} =>{Lower blood pressure}.**β-Blockers-cardio selective and vasodilatory** medicine performance of{High blood pressure, Kidney diseases}=>{Liver failure}. **β-Blockers-non cardio selective** medicine performance of {High blood pressure, Kidney diseases} =>{Scleroderma}. **β-Blockers intrinsic sympathomimetic activity** medicine performance of{High blood pressure, Kidney diseases}=>{Swelling},.this all association relationship is no correlation or independent[lift=1]. **β-Blockers-combined α- and β-receptor** medicine performance of{High blood pressure, Anxiety diseases} =>{Glaucoma},**Direct renin inhibitor** medicine performance of {High blood pressure, Anxiety diseases} =>{Tremors},***α*1-blockers** medicine performance of{High blood pressure, Anxiety diseases} => {Hyperthyroidism},**Central α1-agonist & other centrally acting drugs** medicine performance of {High blood pressure, Hot flashes in menopause}=>{Drug withdrawal}, this all association relationship is positively co correlated [lift=17].**Direct vasodilators** medicine performance of{High blood pressure, Hot flashes in menopause }=>{Lower blood pressure} this association relationship is positively correlated [lift=5]. **Diuretics Loop** medicine performance of {High blood pressure, Kidney diseases} => {Heart failure}. **Diuretics Potassium Sparing** medicine performance of{High blood pressure, Kidney diseases}=>{Irregular heartbeat}.**ARBs** medicine performance of {High blood pressure, Kidney diseases} =>{Chest pain}.**Diuretics-aldosterone antagonists** medicine performance of {High blood pressure, Kidney diseases} => {Coronary artery diseases}.**β-Blockers-cardio selective** medicine performance of {High blood pressure, Kidney diseases}=>{Migraines},this all association relationship is negatively correlated[lift=0]. This all

represented according to anti hypertension drug classes of prevention table structure based computation analyzed.



Graph 2: Anti - Hypertension drugs classes of prevention diseases associations strength correlation lift analysis.

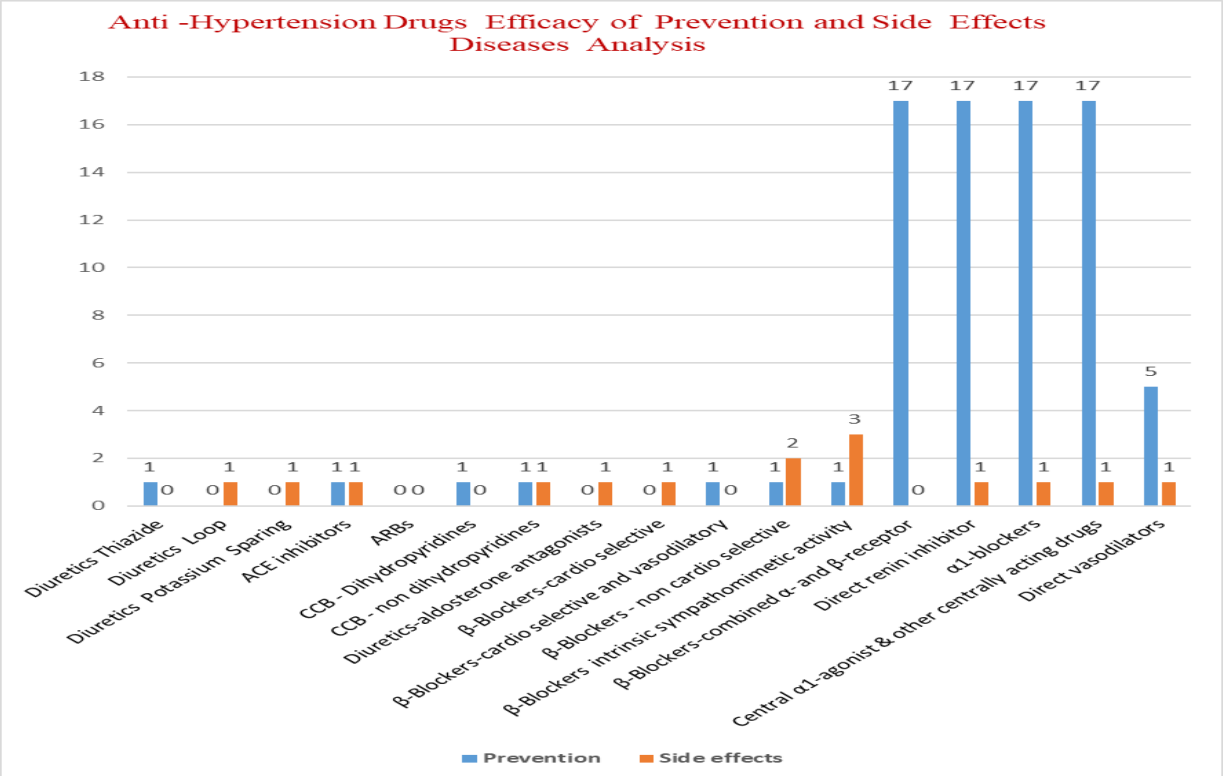
Similarity anti hypertension drugs of side effects computation values are represented about the ratio of confidence to expected confidence in **Diuretics Loop** medicine performance of{Dizziness, Headache}=>{Sudden weight gain}.**Diuretics Potassium Sparing** medicine performance of {Dizziness,Headache}=>{Weakness}.**ACE inhibitors** medicine performance of {Dizziness,Headache}=>{Constipation}.**CCB- non dihydropyridines** medicine performance {Dizziness,Headache}=>{Fatigue}.**Diuretics-aldosterone antagonists** medicine performance of{Dizziness,Headache}=>{Drowsy}.**β-Blockers-cardio selective** medicine performance of{Dizziness,Weakness}=>{Tummy upsets}.**Direct renin inhibitor** medicine performance of{Dizziness,Stomach pain}=>{Headache}.**α1-blockers** medicine performance of{Dizziness, Nausea} =>{Sudden weight gain}.**Central α1-agonist & other centrally acting drugs** medicine performance of{Dizziness,Drowsy}=>{Nausea}.**Direct vasodilators** medicine performance of{Headache,Chest pain=>{Nausea}.this all association relationship is no correlation or independent[lift=1].**β-Blockers - non cardio selective** medicine performance of {Dizziness, Fever} => {Chest pain}. [lift =2]. **β-Blockers intrinsic sympathomimetic activity** medicine performance of {Dizziness, Weakness} =>{Drowsy}.[lift=3]this all association relationship is positively co correlated. **Diuretics Thiazide** medicine performance of {Dizziness, Headache}=>{Nausea}. **ARBs** medicine performance of {Dizziness, Headache}=>{Diarrhea}.**CCB – Dihydropyridines** medicine performance of{Dizziness,Constipation}=>{Swelling}.**β-Blockers-cardio selective and vasodilatory** medicine performance of {Dizziness, Headache}=>{Tummy upsets}.**β-Blockers-combined α-andβ-receptor** medicine performance of{Dizziness,Headache}=>{Sexual Problem},this all association relationship is negatively correlated[lift=0]. This all represented according to anti-hypertension drugs class of side effects table structure based computation analyzed. Lift ratio of confidence to expected confidence from association of anti-hypertension drugs class database, here correlation of lift ratio is [< 1] association of occurrence likely to the absence of the other one or negatively correlated. If lift ratio is [>1] association of occurrence of one implies the occurrence of the other or positively correlated. If lift is [=1] association of occurrence independent and there is no correlation between them. A lift which is greater than 1 indicates a strong correlation between X and Y.



Graph 3: Anti - Hypertension drugs classes of side effects diseases association strength correlation lift analysis

Data mining association rules based identified the anti-hypertension drugs prevention of efficiency and side effects result has explored in graphical visualization evaluation method. The graph clearly representation about the anti-hypertension drugs prevention and side effects of association relationship process. [Graph-4]. Healthcare department professional a Doctor, Pharmacist, Nurse and Researcher would need to understand how different classes of anti-hypertensive drugs might interact with the patient's and medications. They would also need to monitor the patient for potential prevention, side effects of the drugs, and adjust the treatment plan if necessary. If the healthcare professional has access to a predictive data mining technique model, they could use this to anticipate how the patient's condition might change over time and adjust the treatment plan proactively. This kind of analytical knowledge and approach can lead to more effective treatment and better patient outcomes. Here data mining Orange software services as association rules based different types of anti-hypertension drugs prevention diseases , side effects diseases of correlation efficacy analyzed. **Prevention:β-Blockers-combined α-andβ-receptor:** drugs classes medicine of(Carvedilol, Carvedilol Phosphate, Labetalol) probability of prevention correlation{High blood pressure, Anxiety diseases }=>{Glaucoma}.**Direct renin inhibitor:** drugs class medicine of(Aliskiren) probability of prevention correlation{High blood pressure, Anxiety diseases}=>{Tremors}.**α1-blockers:**drugs classes medicine of(Doxazosin, Prazosin, Terazosin) probability of prevention correlation{High blood pressure,Anxiety diseases}=>{ Hyperthyroidism }.**Central α1-agonist & other centrally acting drugs:** drugs classes medicine of **(**Clonidine oral, Clonidine patch, Methyldopa, Guanfacine) probability of prevention correlation {High blood pressure, Hot flashes in menopause} => {Drug withdrawal} and **Direct vasodilators:** drugs classes medicine of(Hydralazine, Minoxidil) probability of prevention correlation {High blood pressure, Hot flashes in menopause}=>{Lower blood pressure} association rule of support, confidence and lift is positively correlated and **Side effects:** Antihypertensive medications are essential for managing high blood pressure, but like any other drugs, they can have side effects. Here are some common side effects associated with different classes of antihypertensive drug's efficacy predicted with association rules. Since **β-Blockers - non cardio selective:** drugs classes medicine of(Nadolol, Propranolol IR, Propranolol LA) probability of side effects correlation{Dizziness, Fever}=>{Chest

pain} and **β-Blockers intrinsic sympathomimetic activity:** drugs classes medicine of(Acebutolol, Carteolol, Penbutolol, Pindolol) probability of side effects correlation{Dizziness, Weakness}=>{Drowsy} association rule of support ,confidence and lift is positively correlated.



Graph 4: Anti – Hypertension drugs class of prevention and side effects diseases correlation lifts analysis.

Above analyzing the association rules between different drugs and their prevention, side effects, pharmacies can predict potential side effects of anti – hypertension drugs. This can lead to the optimization of existing treatments and improvement in patient care and outcomes.

14. SWOT ANALYSIS:

An effective strategic planning method for determining the Strengths, Weaknesses, Opportunities, and Threats associated with project planning or commercial competition is the SWOT analysis. It can be used to assess the efficacy of antihypertensive medications and pinpoint areas in need of improvement in the context of efficiency analysis.

14.1 Strengths:

1. This literature review objectives to explore the data mining knowledge discovery techniques in healthcare departments to organization for a better decision-making process in Medical sector.
2. The hypertension diseases and anti-hypertension drug classes literature review can be improve the efficacy of clinical trials by identifying patterns and correlations in trial data, leading to more accurate results from different drugs classes.
3. Data mining machine learning software can help to Pharmaceutical industry and Hospitals Doctors can take right decision to better treatment for the patients.

14.2 Weakness:

1. This literature review explore the Anti-hypertension drug classes of prevention and side effects efficiency analyzed with data mining association rule mining techniques. Even though some time patients health condition suddenly symptoms changes are possible, meanwhile Doctor,

Pharmacist and Nurse advices and guidance necessary in Machine learning data mining knowledge discovery techniques.

2. This literature review explore the different types of data mining software applications. Data mining software, hardware and data analytical skill person necessary. Because, if the dataset is very large, the data mining technique might take a long time to process the data, which could delay decision making.
3. This literature review explore about the healthcare department must be follow the proper data collection necessary to get the accurate results in data mining knowledge discovery of result analysis, if any one or two data is missing in database, it may be leads wrong the decision making .

14.3 Opportunities:

1. This literature review of research paper provided excellence knowledge about the data mining knowledge discovery techniques performance in pharmaceutical industry and provided the future research study of activities in Pharmacy, Nursing and Medical domains.
2. The hypertension diseases and anti-hypertension drugs of prevention and side effects literature review study system and research methodology system helpful and role model to other diseases and drug's efficacy.
3. Data mining knowledge discovery techniques helpful to pharmaceutical companies and their sales representatives make more informed decisions, tailor their marketing and sales strategies, and ultimately increase their sales. Since data mining software analytical outcome result leads to improve sales of opportunity of pharmaceutical companies.

14.4 Threats:

1. Data mining software has large database. if malware infections is infected in database it could lead to data threats or system disruption. Data mining software system must be protected with anti-software updated to prevent malware infections.
2. This literature review attention to a patient has been prescribed an anti-hypertension drug. Meanwhile if the patient consumes the drug after its expiry date, the drug may not effectively control their blood pressure due to reduced potency. This could lead to health risks such as serious and life-threatening diseases may be affected.
3. Licensed anti hypertension drugs are prescribed to consume patients. Patients without Doctors prescription consume the medicines, it lead to death threats.

15. CONCLUSION AND FUTURE WORK:

The pharmaceutical sector needs of knowledge discovery of co-occurrence relationship among the drug classes diagnosis and drugs efficiency. Pharmaceutical active ingredients prescribed to different patient groups by experienced doctor or pharmacist, since Data mining knowledge discovery database KDD techniques used to Pharmaceutical, Bio informatics and medical sector. The effectiveness of an association rule between support, confidence, and lift in the antihypertensive medication class of items determines performance in terms of illness prevention and side effects. This can be measured using data mining knowledge discovery approaches. A popular method in computational statistics is the Apriori algorithm, which finds item sets that have a support larger than a pre-specified value frequency and determines the confidence of all conceivable rules based on those item sets. Two indicators of a rule's interest are support and confidence, which show how certain and helpful newly discovered rules. This study and analysis have detailed about the data mining unsupervised learning approach methods, since future its used to knowledge discovery in new drug class of efficiency from drugs database or mining for interesting patterns and relationship of diseases large database.

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