Child Health Tracking System using React

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Abstract— The new generation of children faces increased vulnerability, particularly due to the rise of remote learning and excessive screen time leading to a sedentary lifestyle also with the concern of diseases like COVID-19, the child's health monitoring and child's immunization status becomes very crucial. These factors contribute to potential mental and physical health issues for the child in future. This research paper deals with this major issue addressing all the major aspects of children's health and it aims to compare it with the project and the previous research and work done on this topic. The data effective technology used in the project like React and mongoDB also helps to scale up the proposed project with much advance and easy-to-use interface and data visualization contributes to a large part of its effectiveness. By doing this, the study aims to provides valuable insights for effective child health monitoring and intervention strategies.

Keywords— Child health, immunization, health monitoring, React, MongoDB

I. INTRODUCTION

Child health refers to overall well-being including physical, mental, and social development of a child. It focuses on all the necessary conditions required like environment, resources, and support to thrive and reach to their full potential. It is also very crucial for overall progressive growth of a child. With the advent of technology and increasing screen time and pandemics like COVID-19 to track the health of a new-born holds at most priority.

The factors that contribute to most part of child's health are -:

1. Nutrition: A balanced diet is essential for children to receive the necessary nutrients for growth and development.

2. Physical Activity: Regular physical activity is vital for children's overall health.

3. Sleep: Adequate sleep is critical for children's growth, cognitive function, and overall health.

4. Vaccinations: Immunizations are essential to protect children against preventable diseases also helps to build immunity and prevent the spread of infectious illnesses, and during pandemics like COVID it is one of the most crucial factors.

Access to healthcare services, including paediatricians, specialists, and necessary treatments, is vital for maintaining child health. There are also factors like emotional well-being and environmental factors which affect the children's health, but they are not trackable. This paper keeps all these point in consideration and keep track of all these things.

Table 1. Indicating factors affecting child health

Infant Mortality	28 deaths per 1000 live
Under-5-Mortality	30 deaths per 1000 live
Vaccination	85% coverage
Malnutrition	22% underage of 5
Access to Healthcare	84%

This paper deals with the details, method and tech used to track all these factors in a child's health. With the help of a react based website it tracks all the necessary information related to child's health and stores all the values related to the health of children

II. LITERATURE REVIEW

When designing projects like this the usability or the extent to which they are easy to use and accessible to a wide range of users holds the concern of the programmer. A user-centred design has been shown to be effective in creating health education tools that are accessible and effective for limited-income families in rural areas (Atkinson et al., 2018) [1]. This suggests that designing health tracker websites and apps with the needs and preferences of their target users in mind can help to ensure that these tools are effective and useful for their intended users, in addition to this wearable technology that includes features such as self-reflection has been found to engage users and promote healthy behaviours (Chung et al, 2018) [2]. This highlights the importance of incorporating engaging features in health tracker websites and app to increase their effectiveness and usability. Research by Jang et al. in 2020 aimed to design and implement such web-based children health management system. It tracks the children's data, including vaccination records, growth charts, and medical history. Research found that it was effective in managing the health records and providing timely reminders for immunizations and check-ups [3].It is also effective in promoting the healthy behaviour among children and also providing back good feedback to parents [4].The application usability shows a importance as in research done by Han et al. (2018) developed a mobile application tracking the children's information and give back the feedback in game-like features. The study found that this gamification made the application more engaging and effective in promoting health behaviour among children [5].

A web-based baby monitoring system was created by the researchers which shows that monitoring system consisting of different modules including sensors sending the data to the

database server and then that data getting visualize through a web application using push notifications [6]. This concluded that the monitoring of such data plays a very vital role in better infant care.

The timing is very important when we are talking about [9] immunization of infant as it is done when the maximum immune response can be anticipated. It mentions that immunization of children requires vaccination strategies which most significantly done based on the timing, this conclude that to keep a track of vaccination status of child is very crucial and we are doing that with the help of alerts and notifications in our web-application. In this study done by the researchers they presented a system that allows to track the heights and based on that predict his age of puberty, also the nutritional advice for that. It uses the regression techniques to predict the height in near future and evaluate health status and give appropriate response related to that [10].

In India, around 500,000 children under five dies annually from vaccine preventable disease. That is not a small number all those innocent lives are gone due to lack of efficient immunization delivery and lack of health care facilities [11], and more specifically this was done in the rural areas of idea this shows we need to reach to the masses for such things as due to the digital revolution now rural households also have facilities of internet access so now they can use this type of tech to keep a track of immunization which can help in saving a lot of lives.

It is found that the teenage children and youngster living in developing countries cconsuming unhealthy packet food. Research done on this type of food effect across time on children, the study was assessed and tracked that consumption of all these unhealthy commercial food and beverages (UCFB) generally found in children residing in rural/ urban Cambodia. The research concluded that only about 10.8% of children maintained a health consumption pattern. This tells us a lot about how the tracking of nutritional value among infants plays a crucial role in overall eating patterns of a child [12].

The health & demographic observation systems (HDOSs) are vital for understanding population health. The CHAMPS mission purposes to mitigate child deaths through surveillance data and innovative methods. Six out of seven CHAMPS sites have active HDSSs. These systems play a crucial role in generating actionable health and demographic data to reduce child mortality.[13]. "Discriminations in childhood effect across the whole life, highlighting the urgent need for action to decrease child health inequity as a priority." [14]

The study in Tanzania revealed that inconsistent policy responses and resource diversion during the COVID-19 pandemic led to a perceived prioritization of COVID-19 services over motherly and child health facilities. This resulted in reduced utilization of immunization services, along with fewer organizational deliveries. To address future emergencies, it is essential to maintain a balanced policy response that does not undermine the demand for vital mother and child healthcare services.[15]

All these papers are pointing to the benefits of monitoring the children's data at the early age for a potential boost in the overall development of the child's health not only physically but also the mental growth. Alerts on immunization or vaccination also plays a vital role in the situation like this where such harmful diseases like COVID-19 are on a rampage.

III. METHODOLOGIES

The past methods used to implement such kind of tech are like the physical devices used to track the complex values which require the physical assistance of technical peoples but now with the advance tech and the ease to operate with all the easy-to-use interfaces we can skip all those methods.

Some of the older ways for keeping track of this type of data were like in this research done the tracking of the data by working with a data sample by testing on a group of boys ad girls by constantly monitoring them for a period of time and analysing the result based on that [16].The study done in this conclude that physical activity at very early childhood provide stability to overall growth and health of the person along the life course from youth to adulthood.

Now coming to the methods used to implement all the components for the health tracker –

A. React

It is a javascript frontend framework which help us to create the features like dashboards and visualize the data, also the whole interface of the web-application will be done using it. It uses JSX so we don't have to go through all the headache to write complex html code instead of that we can write the html in javascript itself. JXS stands for javascript XML, It is same as html but the implementation of this is done in javascript. This helps us to write all the logic code as well as the structure code of a web-application in single format which will make the application much easy to write understandable.
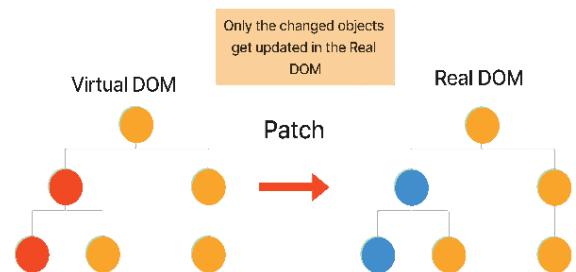

Fig. 1. Showing working of 2 virtual DOMs react

React maintains two virtual DOMs and update the real DOM with the help of batch component called state changes. This makes react a lot more efficient as it doesn't have to re-render everything each time. Also react works on single page application format where it uses components, these are the reusable piece of code which can be written ones in the project and can be used again and again by just changing their corresponding data values [8].

We can compare the react by the use and popularity of the technology among people. Figure 2 shows the trend of react js in comparison to vue and angular frameworks.
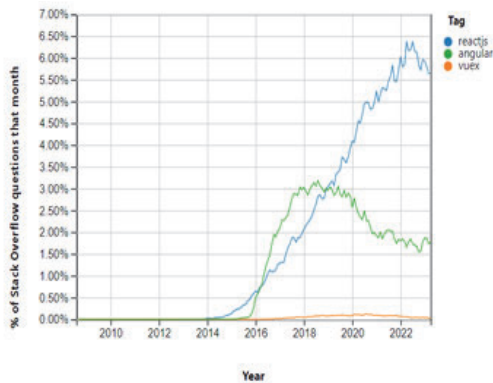
Fig. 2. Showing the search trend of react

B. *Mongo DB*

- It is a popular open-source NoSQL database that operates and work on documents. It gives us the flexibility to add, delete or manipulate data in form of documents as we are working on health tracking where basically adding data is basic need and to maintain that data carefully. As mongoDB is cloud-based database it will store and manage data on cloud rather than just a local host machine which makes our application more scalable and it's easy to use interface also help to efficiently work on it.

- It works on a Data Sharding which basically allows the splitting of large data chunks for a distributed and faster query execution process.

C. *Single page architecture*

Latest and one of the best approaches for better functionality and usability of web applications. Is to abandon browser plugins and make applications with subsets of javascript [9]. It is made up of individual component that can be replaced and updated independently, without reloading the content of the page so it will not perform any reload and will save the network overhead and make the web application UI smoother and faster [10]. The individual component then can be used again and again without re-writing the code. It is responsible for handling the interactions such as button click, input from keyboard etc. and hence leads to very fluid user interface.
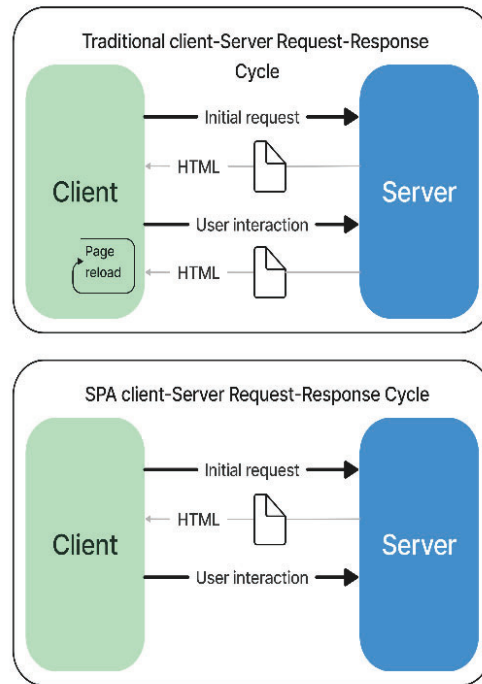

Fig. 3. Demonstration of SPA and difference with Traditional way

IV. PROPOSED WORK

The overall procedure to be followed to achieve efficient health tracking and analysis using this method we must perform a series of steps which will lead us to our desired conclusions and results. Following are the basic steps for it-
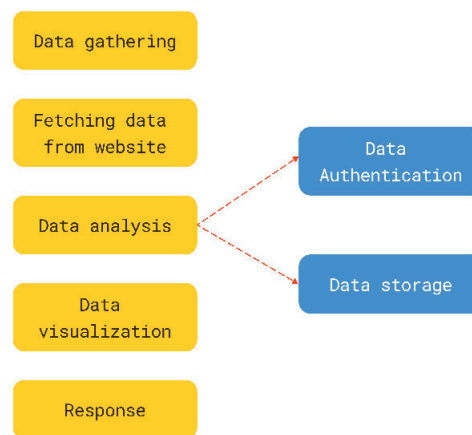

Fig 4. Steps involved in the application.

The whole web page also requires a smooth workflow of the actions also how we will manage different pages for user ease and usability criteria. This is the flowchart for the webpage.
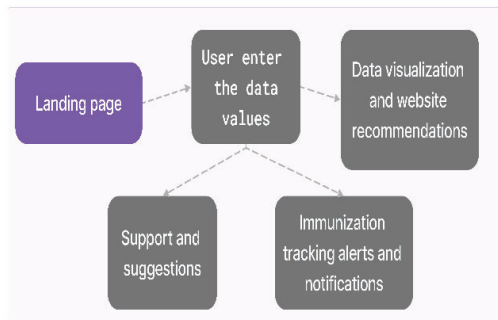
Fig. 5. Flow of the application

A. Data gathering

This will be done when the user will sign up first time on the website also the health-related data will be continuously gathered by the users on the daily basis, so we will have a large collection of data to work with.

B. User personal data

This will be the personal information related to the parents which help us to differentiate and authenticate users based on it.

C. Health related data

This dataset will be comprised of the various factors like nutritional intake, sleep time, vaccination status etc.

D. Fetching data

After gathering the data our second most crucial task is to store that data in the database after fetching the data using technology like node js from the server-side 9code we will authenticate as well as analyse the data and the verified data will be stored in the database.

E. Databases

The NoSQL or we can specifically point out mongo DB as the database for storing all the data for the rather than using the classic table format for data storage the mongo DB \uses documents to store the data as in documents we can store different values for each client which increases the flexibility and make the application more efficient,

F. Data visualization

The layout of the application is created using the reactjs a popular javascript framework it is used to increase the user usability and enhance overall look of the application which will provide us a edge over other technologies used for the front end work. The framework is chosen based on comparative analysis of the framework with other famous frameworks like Vue and angular.

V. RESULT & CONCLUSION

The data comprising the most weighted significance which is children's health related data will be visualized in the form of graphs and pie charts which will be illustrated on the dashboard of the user which also indicates the clear growth rate or decline in the overall children's development. Data visualization is the most crucial part in health care as it helps the analysts to communicate the reports and results from the analysed data.

It Is Important to visualize all the dataset as the intricate relationships and patterns that can be challenging to comprehend solely through raw numbers or text it will be easy to analyse using the graph or pie chart patterns as we will clearly notice any significant changes in the track of the line of the graphs. It is also easy for a person from non-medical background to analyse those results based on the graph value and can easily identify the problems and can respond in a beneficial way to the problem.

In conclusion, the Child Health Tracker system presented in the research paper give a comprehensive solution addressing the growing concerns of remote learning, excessive screen time, and the impact due to the diseases like COVID-19, the system proposed aims to promote the overall development, growth and well-being of children. Through the implementation of a user-centered design and engaging features, such as data visualization it ensures accessibility, effectiveness, and usability for both parent and child. By keeping track of vital health indicators like nutrition, physical activity, sleep patterns, and vaccination status, the system provides valuable insights and reminders, enabling proactive intervention strategies.

The technologies used like React and MongoDB makes whole system more efficient and enhances the system's performance and scalability, the single-page architecture further upscale all these points resulting in a seamless user experience eliminating page reloads and a huge reduction in network overhead. It also contains the related studies done which supports the significance of early monitoring and management of children's health for optimal growth and nourishment of the child. By using the advanced technology and providing a user-friendly interface, it becomes a valuable tool for empowering parents and make the decisions regarding their children's health.

In future the refinement and improvement can be done in this system by taking user feedback, incorporating additional features, and integrating advancements in healthcare technology. By this it will become more scalable and reliable resource for effective child health monitoring, intervention and support.

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