I. INTRODUCTION

With the increasing variety and affordability of ”wearable devices,” monitoring one’s health has become easier than ever before. Almost all personal daily activities, such as exercising, walking, working, sleeping, and eating, can be recorded and monitored by wearable devices or applications. This, in turn, generates a massive amount of personal health data. A health management system is needed to organize and analyze this personal health data. Unlike management systems at the organizational level, which have been widely studied by experts, research into management systems for personal health data remains limited.

One of the main challenges in designing personal health management systems is how to integrate and analyze heterogeneous health data from various sources, such as mobile phone apps, website apps, or smartwatches. A very feasible solution for this challenge is to use a flexible data representation, such as a knowledge graph (KG). Knowledge graphs use graph structures (nodes, edges, and properties) to model any kind of data. This structure is inherently flexible and capable of handling diverse data types. Moreover, according to [1]–[4], KG have emerged as a promising solution to address critical health-related issues and chronic disorders more effectively. By leveraging the inherent flexibility and semantic richness of KGs, a personal knowledge graph (PKG) offers significant potential for designing a robust personal health management system that can seamlessly integrate and process diverse health data formats. Its ability to provide personalized insights while maintaining data interoperability makes PKG the ideal choice for managing personal health data.

A personal knowledge graph (PKG) is a user-centric KG, a structured representation consisting of entities and relationships, where entities are the real objects or concepts existing in the real world and relationships describe associations among these entities that can be applied particularly to enhance the effectiveness of managing and utilizing personal health data [5]–[7]. It can be used to visualize personal data. However, there are several limitations of PKG, such as: (1) the need to perform advanced queries on the graph to derive insights for personal health, and (2) the fact that PKG is naturally not as interactive as chatbot-style applications, which can quickly respond to a user’s query and dig deeper to understand what the user really wants. To address these limitations, we propose integrating an LLM-RAG mechanism on top of our PKG. This integration enables access to relevant information from the PKG in context and transforms it into actionable, contextual health insights, thus increasing the accessibility and usability of such complex health data for individuals.

This research aims to propose PHMKG, a system equipped with a chatbot agent that leverages the integration of PKG and RAG. This system addresses the challenge of managing heterogeneous data from wearable devices and health apps, providing contextual health insights that enhance personal health management.