End-of-life (EoL) management of electric vehicles lithium-ion batteries (EVs-LIBs) has become a vital part of circular economy practices, especially in the European Union (EU). Consequently, manufacturers must develop EoL management of EVs-LIBs through reverse logistics (RLs) activities, which are bounded by many implementation barriers. Although several studies have been accomplished for RLs barrier analysis in various industries, less attention has been devoted to identifying and systematically analysing barriers of EVs-LIBs RLs. The purpose of this study is to identify a comprehensive list of the main barriers to the successful implementation of EVs-LIBs RLs practices. Based on the inputs from European industrial experts, an integrated approach of Total Interpretive Structural Modelling (TISM) and Cross-Impact Matrix Multiplication Applied to Classification (MICMAC) was applied to develop a hierarchical model based on the defined barrier categories. Finally, the most dominant barrier categories to the successful implementation of RLs activities for EVs-LIBs were prioritised to provide insights to industrial decision-makers and policymakers. Data were gathered using a questionnaire survey, which was distributed to various experts in EVs-LIBs manufacturing/recycling and EVs manufacturing companies. The findings revealed that ‘market and social’, and ‘policy and regulations’ categories are the two most influencing barriers to the implementation of EVs-LIBs RLs. This study lays the foundation for future research on the RLs activities for EVs-LIBs in a time when EU regulations on the circular economy are mandating all auto manufacturing companies to deal with their EoL wastes.