ABSTRACT Antimicrobial resistance (AMR) of microorganism against synthetic antibiotics and side effects of synthetic drugs are the major problems related to use of these drugs for treating different ailments. Many microbes have been developed resistance against some antibiotic due to various reasons such as misuse of drugs and poor treatment strategy. The cure of a number of diseases got complicated and difficult due to decrease in synthetic antibiotics efficacies. The security of individuals' health is at risk due to AMR. The cost of treatment for AMR infections is getting high to poor effectiveness of synthetic drugs against these diseases. The AMR problem can be resolved by the production of new medicinal compounds which bacterial defense system cannot develop resistance. Enormous diseases are spreading due to oxidative stress in biological system; one of the best examples of it is Diabetes Mellitus. Oxidative stress leads to interruption in physiological processes occur in a biological system which causes metabolic disorder. There are many synthetic antioxidants are present in market which are being used for scavenging of free radicals such as reactive oxygen species. But the use of these synthetic antioxidants is not risk free and cause many health deteriorating problems. WHO declares that 80 % people of developing countries are using different plants for treating various diseases. Therefore, researchers are focusing on the analysis of plants that have pharmaceutical agents such as antimicrobial or antioxidant. Previous study revealed that plant's secondary metabolites consist of efficient antioxidant and antimicrobial compounds. Nevertheless, the complete analysis of these metabolites is under process. So, plant natural products are best alternate of synthetic medicines to cure antimicrobial and antioxidant related diseases. The current work was performed to measure the antioxidant and antimicrobial potential of *Cascabela thevetia* leaves. The work can be divided into two parts; one is related to metabolic screening and profiling of Essential oils extracted from *C. thevetia* leaves and other is related to metabolic screening and metabolic profiling of *C. thevetia* extract, antioxidant and antimicrobial potential determination of this extract. Essential oils of leaves were extracted by using hydrodistillation Clevenger-type extractor. In this process 200gm leaves were cut into small pieces and added to round-bottom flask along with distilled water. The extraction of EOs was performed on 70 0C. Then obtained extract was subjected to solvent extraction with DCM and treated with NA2SO4 in order to remove water content. Then this sample was forwarded for FTIR and GC-MS analysis. Whereas, in cases of leaves extract preparation, the quenching of freshly plucked leaves was made with liquid nitrogen after cleaning of leaves. Then solvent composition was prepared by mixing ethanol and water in proportion of aqueous, 20% ethanol, 40% ethanol, 60% ethanol, 80% ethanol and 100% ethanol. Quenched leaves powder was extracted with these solvents' composition through ultra-sonication for 30 min followed by rotary evaporation, and lyophilization to eliminate all water content. After the calculation of extract yield %, then antioxidant potentials of these extracts were measured by ABTS Assay and DPPH assay. The antimicrobial activities of extracts were determined by using well-diffusion method against two bacteria; *Klebsiella pneumonia* and *Bacillus coagulans*. Findings revealed that peaks of N-H, C=O, C-H, C-N, C-O, O-H, C=C, and other functional groups were detected in EOs of *C. thevetia* leaves by FTIR analysis and 24 compounds were identified in EOs of *C. thevetia* leaves by GCMS analysis. On the other hand, yield obtained from *C. thevetia* leaves extracts were 42.08%, 19.76%, 18.64%, 18.18%, 18.58%, and 18.50% for aqueous, 20% ethanol, 40% ethanol, 60% ethanol, 80% ethanol, and pure ethanol, respectively. DPPH radical scavenging percentage was 41.81%, 36.99%, 36.31%, 35.12%, 35.21%, and 34.44% for aqueous, 20% ethanol, 40% ethanol, 60% ethanol, 80% ethanol, and pure ethanol, respectively. TEAC value of these extract calculated through ABTS assay was 8.96, 7.84, 7.72, 7.71, 7.62, and 7.60 mM for aqueous, 20% ethanol, 40% ethanol, 60% ethanol, 80% ethanol, and pure ethanol, respectively. Antibacterial activity was only shown by only aqueous sample against *K. pneumonia* and inhibition zone diameter was 1.3cm. No sample was active against *B. coagulans*. The methylation of highest yield sample (aqueous) was executed by methanol and forwarded for GC-MS analysis. 29 compounds were identified in derivatized extract through GC-MS analysis.